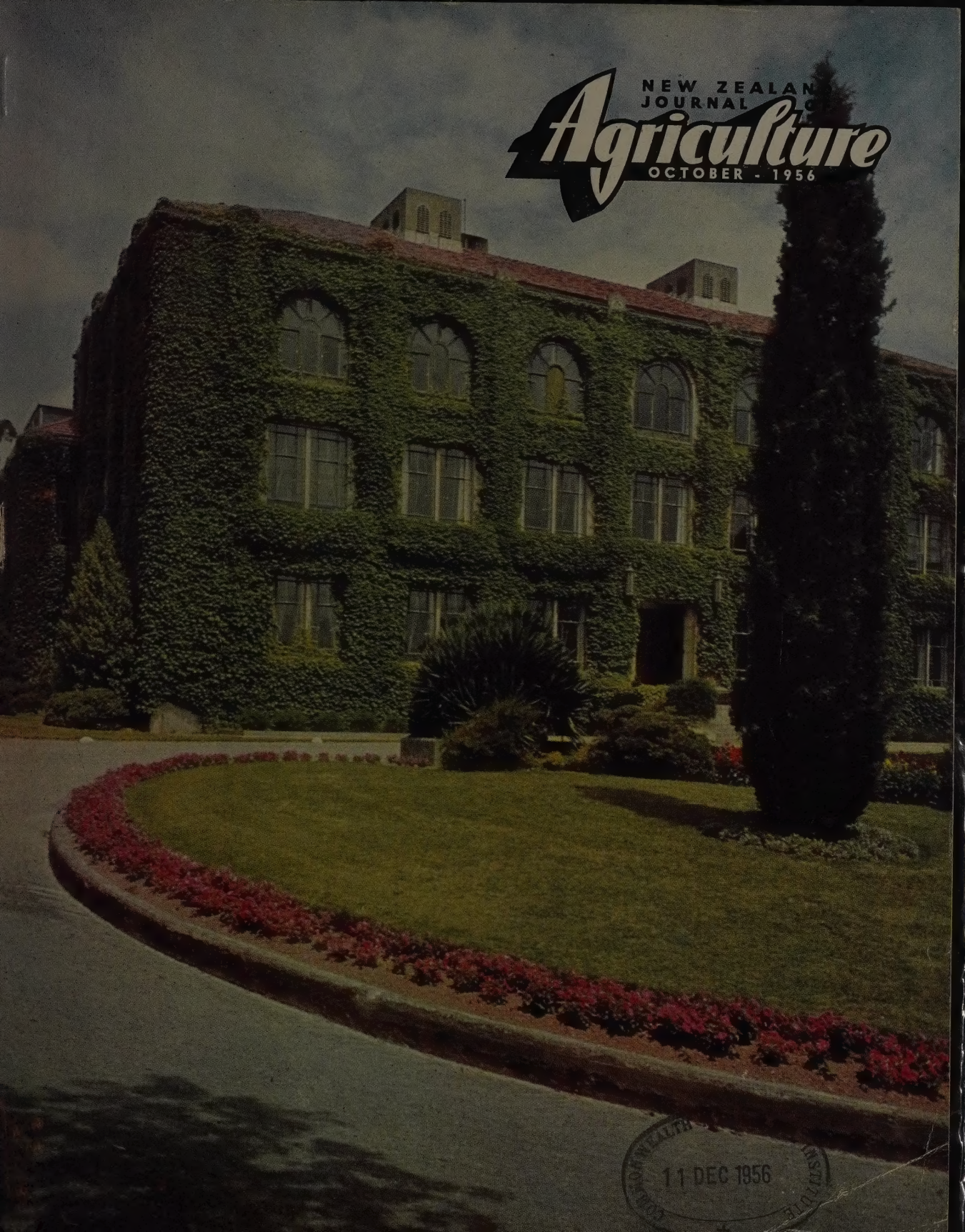

COMMONWEALTH AGRICULTURAL BUREAUX INSTITUTE
11 DEC 1956

Cooper News

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No. 50 PUBLISHED EVERY SECOND MONTH OCTOBER, 1956

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15 October
1956
(Established 1910)

NEW ZEALAND JOURNAL OF Agriculture

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Direction
of
Rt. Hon. K. J. Holyoake,
Minister of Agriculture

This Month's Cover

The main building of Massey Agricultural College, Palmerston North, venue of the Seventh International Grassland Congress on 6-15 November (see p. 310), is the subject of this month's cover. The College, opened in 1928, is set in 25 acres of beautiful grounds on an elevated site overlooking the College farm (1250 acres) and the Manawatu River. There are two hill country properties worked in conjunction with the home farm, "Tuapaka" of 1050 acres 8 miles from the College and "Rata" of 1908 acres of hard, high danthonia country 64 miles away in southern Hawke's Bay. Extensive agricultural and related research is carried out at the College and in several other research institutions in the district. Colour photograph by R. V. Francis Smith.

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REGISTERED AT THE G.P.O., WELLINGTON, AS A MAGAZINE.

SEVENTH INTERNATIONAL GRASSLAND CONGRESS

WITH the holding of the Seventh International Grassland Congress at Massey Agricultural College, Palmerston North, in November, New Zealand will become the second country outside Europe in which this important gathering of agricultural scientists has been held. The Sixth Congress at Pennsylvania State College, U.S.A., in 1952 accepted New Zealand delegates' invitation on behalf of the New Zealand Government to hold the next congress here and when subsequently the New Zealand Government sent invitations to all Governments likely to wish to send representatives to such a conference, acceptances were received on behalf of up to 200 leading overseas authorities on grassland science. About 100 New Zealand scientists will bring the total attendance at the congress to about 300.

THE First International Grassland Congress was held in Germany in 1927 and others have been held in Sweden and Denmark (1930), Switzerland (1934), Great Britain (1937), and the Netherlands (1949).

This Seventh Congress, which is sponsored by the New Zealand Government, has been organised by a committee of the New Zealand Grassland Association under the chairmanship first of Dr. J. Melville, and later, since Dr. Melville took up the appointment of Director of the Waite Research Institute, South Australia, of Sir Bruce Levy. Both these men are former Directors of the Grasslands Division of the Department of Scientific and Industrial Research. Mr. S. H. Saxby, Agrostologist of the New Zealand Department of Agriculture, Wellington, is the organising secretary for the congress.

The congress is a specialist one, the aim being to bring together as many as possible of the leading workers in the grassland and animal research fields and give them an opportunity to exchange information and ideas on grassland and animal production.

The congress will be held from 6 to 15 November and will be officially opened by the Governor-General, Sir Willoughby Norrie.

Congress Programme

There will be 13 full sessions with the following titles, chairmen, authors, and papers:—

Wednesday, 7 November

1. **Macro- and micro-climatic factors in pasture production; W. M. Hamilton (N.Z.):**

J. A. Prescott (Australia): Macro- and micro-climatic factors in relation to pastures.

A. Jantti (Finland) and P. J. Kramer (U.S.A.): Regrowth of pastures in relation to soil moisture and defoliation.

M. A. J. Goedewaagen (Holland): Root development of grassland with special reference to water conditions of the soil.

K. J. Mitchell (N.Z.): The influence of light and temperature on the growth of pasture species.

Thursday, 8 November

2. **Pasture establishment and management; W. Davies (U.K.):**

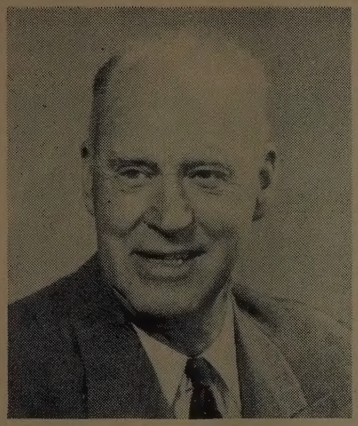
M. L. 't Hart (Holland): Some problems of intensive grassland farming in the Netherlands.

C. M. Donald (Australia): Competition among pasture plants.

P. D. Sears (N.Z.): The effect of the grazing animal on pasture.

R. E. Wagner (U.S.A.): Pasture establishment with special reference to band seeding.

Massey Agricultural College, 3 miles from the city of Palmerston North, where the Seventh International Grassland Congress is to be held in November. Static exhibits of New Zealand's agriculture have been arranged in the main building in the foreground. Field displays of grassland practices and management have been arranged in fields off the picture right. Refectory and accommodation buildings half-circle the campus at left back of the main building. Bruce Watt photo.



[*National Publicity*

P. W. Smallfield, Director of the Extension Division, Department of Agriculture, whose long experience in agricultural experimental and advisory work, especially with problem areas, will lend authority to his special paper "Farming in New Zealand".

3. The pasture: grazing animal complex; M. M. Cooper (U.K.):

J. T. Reid (U.S.A.) and W. K. Kennedy (U.S.A.): Measurement of forage intake by grazing animals.

W. F. Raymond (U.K.), D. J. Minson (U.K.), and C. E. Harris (U.K.): The effect of management on herbage consumption and selective grazing.

L. R. Wallace (N.Z.): The intake and utilisation of pasture by grazing dairy cattle.

C. P. McMeekan (N.Z.): Grazing management in relation to animal production.

Friday, 9 November

4. Legumes and the nitrogen cycle; I. L. Baldwin (U.S.A.):

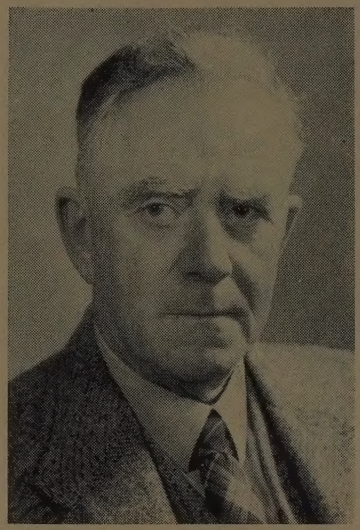
T. W. Walker (N.Z.): Nitrogen and herbage production.

G. W. Butler (N.Z.) and N. O. Bathurst (N.Z.): The underground transference of nitrogen from clover to associated grass.

J. M. Vincent (Australia): Strains of rhizobia in relation to clover establishment.

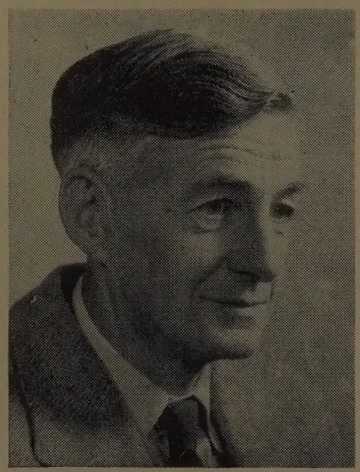
5. Environment and plant improvement; E. T. Jones (U.K.):

W. Hartley (Australia) and R. J. Williams (Australia): Centres of distribution of cultivated pasture grasses and their significance for plant introduction.



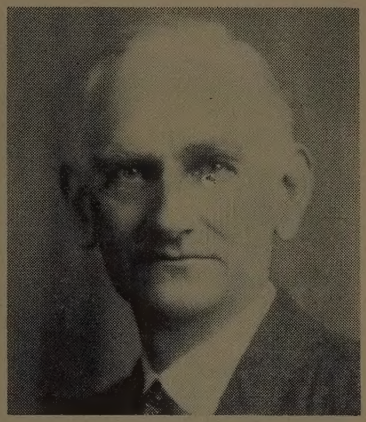
[*National Publicity*

Sir Bruce Levy, chairman of the organising committee of the congress, formerly Director of the Grasslands Division of the Department of Scientific and Industrial Research, and whose knighthood in recognition of outstanding work for agriculture was conferred by the Queen on her visit to New Zealand. Sir Bruce is associated with A. H. Cockayne, formerly Director-General of Agriculture, in a special paper "Grasslands of New Zealand".



[*National Publicity*

S. H. Saxby, organising secretary for the congress, is an agrostologist of the Department of Agriculture and a well-known authority on pasture production.



[*S. P. Andrew*

A. H. Cockayne, former Director-General of Agriculture, whose paper in collaboration with Sir Bruce Levy traces the rise and development of grassland science in New Zealand.

J. W. Gregor (U.K.): Genotypic-environmental interaction and its bearing on a practical problem of international interest.

W. M. Hiesey (U.S.A.): Responses of hybrid bluegrass strains to contrasting environments.

J. Rebischung (France): Grass breeding and environment.

Monday, 12 November

6. The digestion of pasture herbage by the ruminant animal; G. L. McClymont (Australia):

A. T. Phillipson (U.K.): Recent advances in ruminant physiology.

E. J. Underwood (Australia) and R. J. Moir (Australia): Protein utilisation in the ruminant.

A. T. Johns (N.Z.): The influence of high production pasture on animal health.

R. W. Dougherty (U.S.A.): Recent developments in our knowledge of the causes and prevention of bloat.

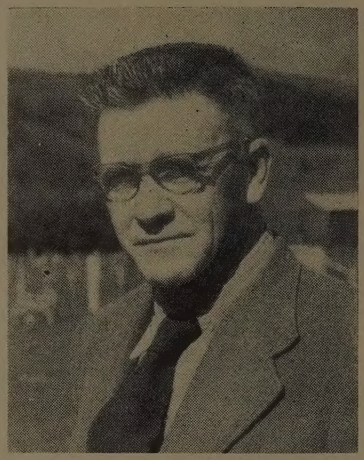
7. Pasture conservation and utilisation; J. Melville (Australia):

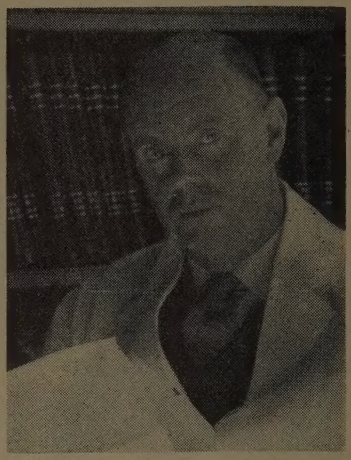
Martin Jones (U.K.): Balancing the needs of the plant and the animal.

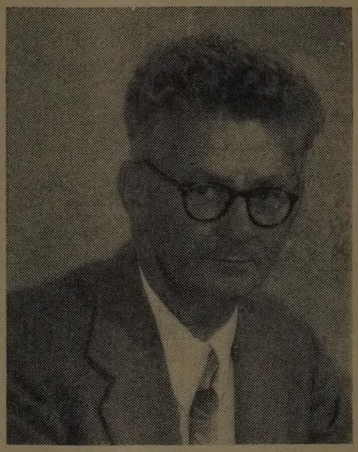
R. A. Hamilton (U.K.) and J. A. Collier (U.K.): Conservation in relation to high pasture production.

R. L. Cowan (U.S.A.), J. W. Bratzler (U.S.A.), and R. W. Swift (U.S.A.): Preservation of grass silage with sodium metabisulphite.

I. V. Larin (U.S.S.R.): Rotation of pastures as the system of planned utilisation and management of pastures.







From left—Dr. I. J. Cunningham, Superintendent, Wallaceville Animal Research Station, Dr. E. B. Davies, Senior Chemist, Department of Agriculture, Hamilton, and N. H. Taylor, Director, Soil Bureau, Department of Scientific and Industrial Research, who are associated in a paper at the congress on the relation of mineral deficiencies to soil type.

From left—L. Corkill, Dr. R. L. Cowan, A. C. Glenday, Dr. G. W. Butler, Dr. A. T. Johns, Dr. J. H. Torrie, and Dr. R. W. Dougherty. Drs. Cowan, Torrie, and Dougherty from the United States are in New Zealand for about 9 months under Fulbright awards and have spent much time at Grasslands Division, Palmerston North, where this photograph was taken. They and Messrs. Corkill and Glenday and Drs. Butler and Johns of Grasslands Division are presenting papers at the congress.

Tuesday, 13 November

8. Macro- and micro-elements in plant nutrition; A. W. Hudson (N.Z.):

A. Ulrich (U.S.A.): Plant analysis as a guide to the mineral nutrition of alfalfa.

A. J. Anderson (Australia): Effects of fertiliser treatments on pasture growth.

N. Wells (N.Z.) and M. Fieldes (N.Z.): The uptake of minerals by sweet vernal and its relationship to genetic soil type.

9. Micro-element and vitamin deficiencies in grazing animals; E. J. Underwood (Australia):

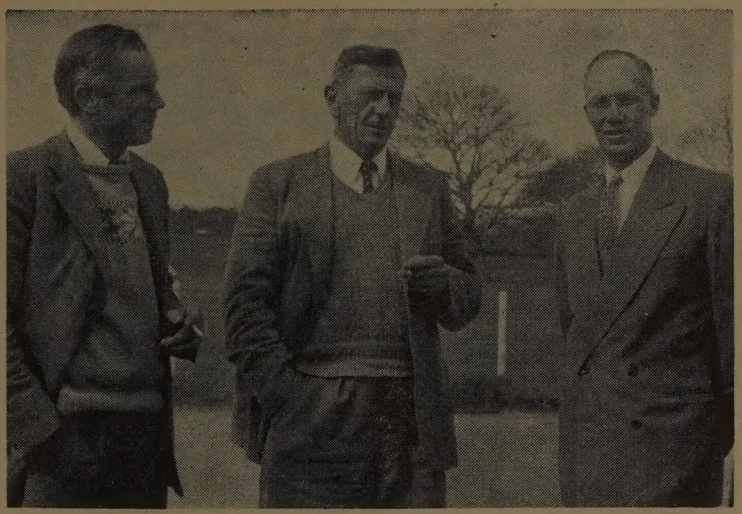
N. H. Taylor (N.Z.), I. J. Cunningham (N.Z.), and E. B. Davies (N.Z.): Soil type in relation to mineral deficiencies.

A. T. Dick (Australia): The effects of inorganic sulphate on molybdenum and copper metabolism in sheep.

R. Allcroft (U.K.) and G. Lewis (U.K.): Copper metabolism in sheep and cattle with special reference to foetal liver storage.

H. J. Lee (Australia): The toxicity of *Phalaris tuberosa* to sheep and cattle and the preventive role of cobalt.

A. B. Grant (N.Z.): The rachitogenic effect of vitamin A.



From left—Dr. L. R. Wallace, Chief Nutrition Officer, Ruakura Animal Research Station, Dr. C. P. McMeekan, Superintendent, Ruakura Animal Research Station, and Dr. W. K. Kennedy, Professor of Agronomy, Cornell University, U.S.A. Dr. Wallace's paper at the congress deals with the intake and use of pasture by dairy cattle; Dr. McMeekan's with grazing management in relation to animal production; and Dr. Kennedy's (in association with Dr. J. T. Reid) with the measurement of forage intake by grazing animals. Dr. Kennedy received one of the five Fulbright awards enabling United States agricultural scientists to attend the congress and to spend 9 months in New Zealand on research in their special fields.

Dr. R. Merton Love (left), Professor of Agronomy at the University of California at Davis, who is a visiting Fulbright Professor at Canterbury Agricultural College, Lincoln, discusses experiments in clover nutrition with Dr. T. W. Walker (right), Professor of Soil Science at Lincoln. While in New Zealand Dr. Love is paying particular attention to the tussock grasslands of the South Island and possible ways of improving their cover and carrying capacity. Drs. Love and Walker will both present papers at the congress at Palmerston North and Dr. Love will also read a paper at the conference at Lincoln.

Wednesday, 14 November

10. Pasture plant breeding; H. Wexelsen (Norway):

D. C. Smith (U.S.A.): The nature of forage crop varieties in relation to methods of improvement.

K. J. Frandsen (Denmark): Progeny testing methods.

L. Corkill (N.Z.): The basis of synthetic strains of cross-pollinated grasses.

11. Special methods in plant breeding; W. M. Myers (U.S.A.):

G. W. Burton (U.S.A.): Utilisation of heterosis in pasture plant breeding.

J. H. Torrie (U.S.A.): Breeding for quantitative characters.

A. C. Glenday (N.Z.) and S. O. Fejer (N.Z.): The use of discriminant functions in the selection of pasture plants, with particular reference to the *Lolium* species.

G. Julen (Sweden): Practical aspects on tetraploid clover.

Thursday, 15 November

12. Pasture development in difficult environments; T. M. Stevenson (Canada):

J. D. Scott (South Africa): The study of primordial buds and the reaction of roots to defoliation as the basis of grassland management.

J. F. Pechanec (U.S.A.): Rangeland development in difficult environments of the sagebrush-grass type in the western United States.

A. L. Hafenrichter (U.S.A.): Improving pastures on lands in difficult environments in the western United States.

R. M. Love (U.S.A.) and W. A. Williams (U.S.A.): Range land development by manipulation of the soil-plant-animal complex in the difficult environments of a Mediterranean-type climate.

13. Improvement and management of tropical grassland; R. O. Whyte (Italy):

C. S. Christian (Australia): Some problems of semi-arid tropical grasslands in Australia.

Dr. Ruth Allcroft, senior research officer of the British Ministry of Agriculture, Fisheries, and Food, is a New Zealander whose scientific career began in the New Zealand Department of Agriculture. In association with Gwyneth Lewis, also of the Veterinary Laboratory, Weybridge, Surrey, she is the only woman scientist to present a paper at the congress. Dr. Allcroft's work and special interests concern mainly biochemical and nutritional problems of animals.

Dr. P. D. Sears, Director, Grasslands Division, Department of Scientific and Industrial Research, whose congress paper deals with the effect of the grazing animal on pasture.

J. Grossman (Brazil): Grazing experiments with beef cattle in Rio Grande do Sul, Brazil.

M. S. Motta (Jamaica): Grazing management and production of some tropical grasses in the British West Indies.

M. Takahashi (Hawaii): Some fundamental aspects of grassland agriculture in the tropics.

Thursday, 8 November

Supplementary Session A: E. J. Fawcett (N.Z.):

P. W. Smallfield: Farming in New Zealand.

Monday, 12 November

Supplementary Session B; G. S. Peren (N.Z.):

Sir Bruce Levy and A. H. Cockayne: Grasslands of New Zealand.

About half those attending the congress will be quartered at Massey College and the remainder in Palmerston North hotels.

Exhibits and Tours

Static displays of features of New Zealand agriculture have been arranged at the College and there will be displays of sheep dogs working, shearing, and agricultural aviation during the congress.

A number of tours of districts of scenic and agricultural interest have been arranged for the weekend during the congress and after the congress.

Lincoln Conference

The post-congress tours will finish in Christchurch in time for the New Zealand Grassland Association's annual conference at Canterbury Agricultural College, Lincoln, on 27-29 November.

Many of the overseas scientists will be attending the conference at Lincoln and several will be giving papers. This conference is not at specialist level and will enable those unable to attend the congress at Massey College to hear the views of these distinguished agricultural research workers and discuss their viewpoints in relation to New Zealand agriculture.

Printed Proceedings

The proceedings of both the congress and the conference will be printed and orders for copies should be placed early with the organising secretary, Seventh International Grassland Congress, Box 1500, Wellington, and the secretary, New Zealand Grassland Association, Box 1500, Wellington, respectively—*G.J.N.*

Plastiproofed Rubber-lined Hose for Irrigation

A SHORT article in the June 1956 issue of the "Journal" discussed the advantages of using plastiproofed rubber-lined hose for spray irrigation. Subsequent inquiries indicate that further discussion is required, as the article referred to did not explain clearly the possible uses of this hose in irrigation.

The hose could well be used in certain circumstances for the main supply line to the field irrigation system, particularly where the spray lines are situated some distance from the source of water, but it would not be suitable as the connecting link between spaced spray heads in the irrigation line, for which a rigid system of piping is necessary.

As a supply line it could be used most conveniently where it does not have to be moved frequently. When it has to be moved the pipeline must be emptied for easy handling, and emptying and moving would be easier if the line were divided into sections with snap couplings.

—*H. W. T. EGGERS,*
Engineer,
Department of Agriculture,
Wellington

Spreading Straw with a Rotary Hoe

By D. W. McCALLUM,
Horticultural Instructor, Department of Agriculture, Blenheim

THE application of organic material to help maintain the fertility and moisture-holding capacity of soil has long been recognised as a sound practice.

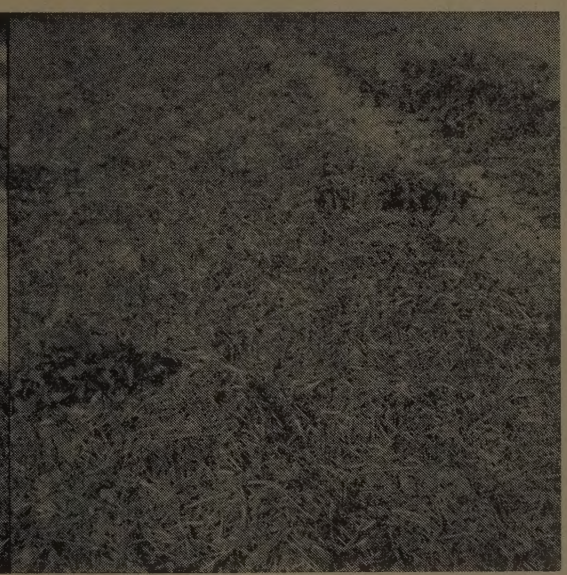
ON land that is intensively cropped it is particularly important to maintain the soil structure and one method quite frequently adopted is the application of pea straw, which can sometimes be bought for the cost of baling and cartage. One grower in Blenheim practises this extensively, but in past years the main expense has been the time required to open up the bales and spread the straw over the area where it is to be ploughed under.

During the past season an effort was made to find an easier way to do this than by hand forking the bales. A tractor-mounted rotary hoe reversed into the bales of straw was found to do the spreading far more efficiently than hand spreading and in about a thirtieth of the time.

The depth to which the straw is spread can be increased by raising the rotary hoe higher with the hydraulic lift on the tractor. The depth wheel on the hoe checks lateral movement of the bales.

Backing on to a bale of straw. The depth to which the straw is spread can be increased by raising the rotary hoe higher with the hydraulic lift on the tractor.

▲ The straw is turned over and over, and at each turn some is spread under the hoes.



▲ The finished job is more efficient than can be done by hand spreading.

Proper Seed Storage and Control of Insect Pests

DETERIORATION in the quality of stored seeds and grain is largely due to the direct and indirect effects of attack by insects and mites. Though information on the protection of seeds is incomplete, L. G. Morrison, Biologist, Department of Agriculture, Wellington, discusses in this article how the adoption of simple sanitation measures will help to avoid deterioration in seeds and lowered food value in grains.

THE protection of seed and grain from insect and mite attack is of great importance to the wholesale merchant who machine dresses and stores large quantities of these products, to the seedsman faced with the problem of preserving bulk seed until it can be packaged, to the storeman and farmer who must carry seed over from one season to another, to the farmer who must carry large stocks of grain for feed, and to the processor who must hold bulk supplies of grain.

Pest-free seed is also important to New Zealand internationally; export grass seed must be pest free before it can be given an international health certificate, and because imported vegetable seeds and grain may become infested in transit, they are inspected on arrival at New Zealand ports and may be required to be treated.

Stored seeds make an ideal diet for a large group of insects known popularly as stored-products insects. These insects have adapted themselves to living on food low in moisture content. The germ of the seed with its high food value is particularly attractive to them and is often the first part attacked.

Pests

The most common pests of stored grain and seed in New Zealand are:—

Grain weevils (*Calandra granaria* and *C. oryzae*) which are small, reddish brown to black weevils about ⅛in. long with their heads prolonged into snouts or "beaks". At the end of the snout the weevil has a pair of jaws with which it eats its way through grain. Eggs are laid directly into the grain, and the larvae hatching from these eggs feed inside the kernel of the grain. A generation of weevils from eggs to adults may develop in 1 month in warm weather.

Saw-tooth grain beetle (*Oryzaephilus surinamensis*), a dark red-brown, slender beetle 1/10in. long with six peculiar saw-tooth-like projections on either side of its chest region. The larvae progress from grain to grain while feeding.

Red rust grain beetle (*Laemophloeus ferrugineus*), one of the smallest beetles found in stored grain, 1/16in. long, flattened, reddish brown, and with long antennae. Usually it is found in grain that has previously been attacked by other pests.

Flour beetles (*Tribolium confusum* and *T. castaneum*), shiny, red-brown beetles about ⅛in. long with a life cycle in warm weather of only 4 weeks. The larvae and adults generally feed on milled products and broken grains. Eggs are laid in cracks and crevices of bins and food containers.

Australian spider beetle (*Ptinus tectus*). This ⅛in.-long, brown, spider-like beetle has been recorded from a wide variety of seeds and grain products.

Flour and meal moths (*Ephestia* spp. and *Plodia interpunctella*). These drab, grey moths have a wing spread of about ⅝in. and can frequently be seen resting on the surface of bulk grain or on the walls and ceilings of bins. The caterpillars spin webs that hold small seeds in clumps.

Flour and grain mites (*Tyroglyphus* spp.). These common, tiny, 8-legged storage pests are closely related to insects. High moisture content of

HEADING PHOTOGRAPH: Bags of seed entering a vault for fumigation with methyl bromide.

grain is the factor most favouring their increase. When attacking grain the mite bores into the soft plumule (shoot embryo), usually eating this first and then gradually eating the wholé of the grain until only the husk is left. Mites can also cause indirect damage by carrying spores of fungous disease, by raising the temperature and moisture of seeds with resultant increase in micro-organisms, and by devaluing the product from human to animal feed.

There are many other pests of less importance. The presence of some, such as booklice (*Psocids*), indicates

Grain weevils and red rust grain beetle attacking wheat. →

that seed is being stored in unsuitable, moist conditions. Stored-products pests can be transported from place to place and over long distances with the greatest of ease. Plant Quarantine Officers are constantly finding grain weevils, pea "weevils" (*Bruchus pisorum*), flour beetles, and drugstore beetles (*Stegobium paniceum*) in seeds arriving at New Zealand ports from overseas. The ability of many of the insects and mites to live dormant for long periods without food and then to become active and breed rapidly when conditions again become favourable must not be overlooked.

Peas infested with pea "weevils" (*Bruchus* sp.). →

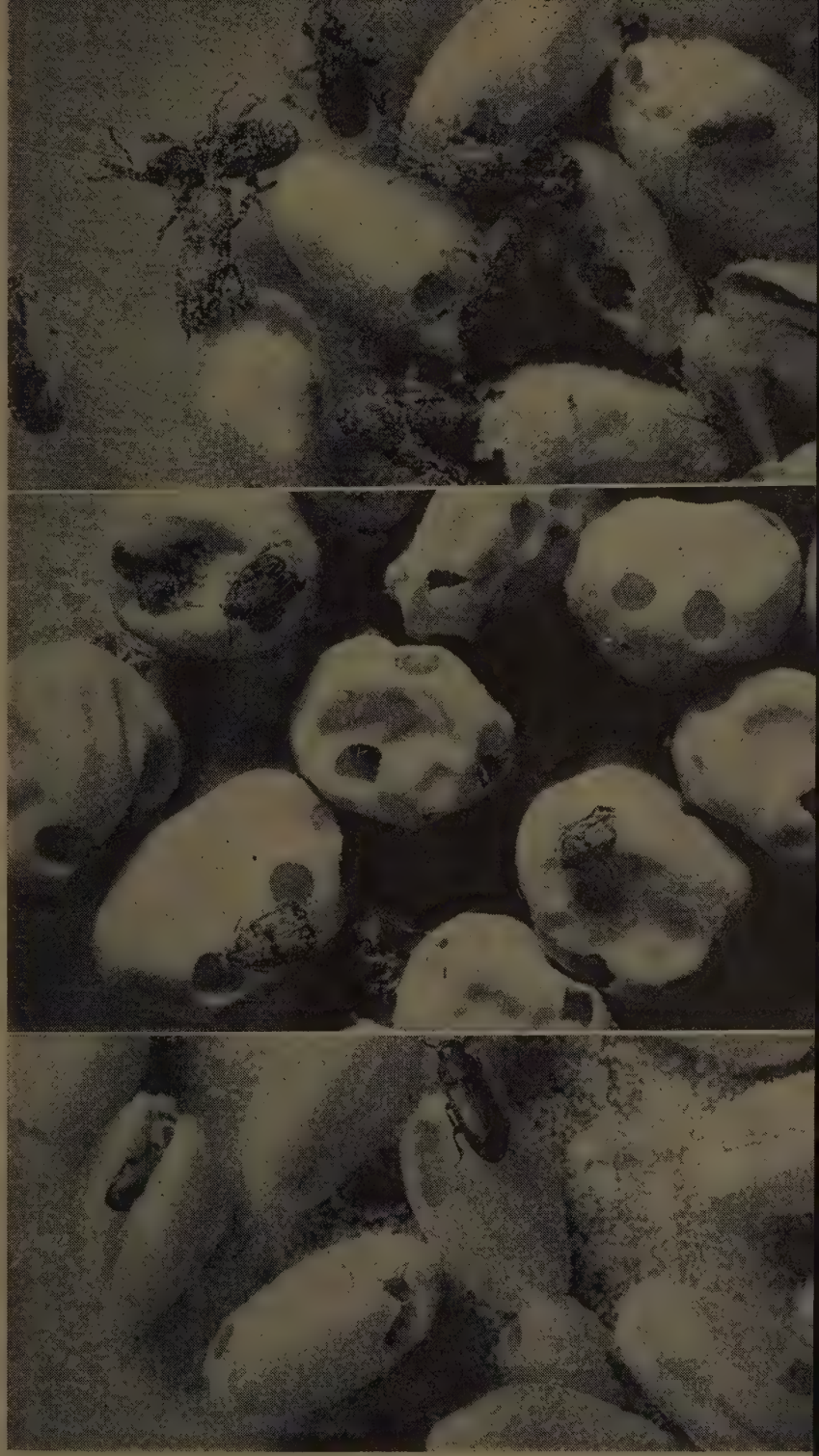
Factors Affecting Development of Grain Insects

Seed should be kept in a dormant condition if its vitality is to be preserved. Seeds of high moisture content held at high temperature lose their germination capacity rapidly. For this reason the fundamental requirement for the preservation of seed is low moisture. Low temperature is also helpful but not indispensable. The factors that speed up the life processes of seed similarly affect the seed-infesting insects. Within certain limits the higher the moisture content of the seed is and the higher the tem-

Flour beetles (*Tribolium* sp.) feeding on wheat. →

perature is, the faster these insects reproduce. Seed that is cool, dry, and free from dust or broken kernels is unfavourable for insect development.

The rice weevil (*Calandra oryzae*) and the granary weevil (*Calandra granaria*), the most serious pests of stored grains, cannot breed in seed with a moisture content of 8 per cent. or less, and they soon die if restricted to such seed for food. Mites, which are not true insects, require food with a rather higher moisture content; they are not troublesome in seed unless the moisture content is above 12 per cent. The flour moths (*Ephestia* spp.) and beetles such as the saw-toothed beetle



Grubs, three matted pupal cases (top right), and adults of the Australian spider beetle in grass seed.

(*Oryzaephilus surinamensis*) and the flour beetles (*Tribolium* spp.) are capable of breeding in seed almost devoid of moisture. Flour beetles are not troublesome in clean, dry seed free from broken kernels, as the young larvae find it difficult to attack undamaged seed.

Temperatures between 70 and 95 degrees F. are most favourable for the development of seed-infesting insects. As temperatures drop below 70 degrees F. their development is retarded. A temperature of 65 degrees F. prevents the reproduction of flour beetles and 60 degrees F. is about the lowest temperature at which rice and granary weevils reproduce. Tyroglyphid (flour and grain) mites are somewhat more hardy and are reported to breed in seed kept between 40 and 50 degrees F., provided the moisture content is above 12 per cent.

Types of Damage

Loss in Weight and Food Value

Grain-infesting insects obtain food and water by eating the grain. The endosperm (starchy portion) of unbroken kernels is the preferred food which may be consumed by adults and larvae of granary weevils. The germ may be consumed by the larvae of moths, saw-toothed grain beetles, and flour beetles. Much of this damage occurs within the kernels and is not visible. Farmers may be unaware of the extent of this type of damage in their grain. Damage to kernels from feeding may vary from slight injury to complete destruction. The amount of damage depends on the kind and numbers of insects present, the moisture and temperature of the grain, the length of time grain is exposed to infestation, and the variety of the grain.

Heating with Resultant Caking and Spoilage

Grain-infesting insects frequently cause heating in small grains as a result of their feeding and other activities. Insect-caused heating, known as "dry grain heating", may bring the temperature of the grain up to 108 degrees F. The warm air from the heating grain rises to the surface and is cooled, and some of the moisture is deposited on the surface grain. Moulds and fungi develop in the moist surface grain and caking and spoilage of the grain result. Dry grain heating develops in grain of less than 15 per cent. moisture content, and should be distinguished from "wet grain heating", which occurs only in grain with higher than 15 per cent. moisture. Wet grain heating results from the activity of yeasts, moulds, and fungi and the respiration of the stored grain itself. In this kind of heating the temperature of the grain may rise as high as 144 degrees F. Insects cannot survive under wet grain heating. Both dry and wet grain heating may develop simultaneously in different parts of the same bin.

Lowered Germination of Seeds and Malt Grain

Lowered germination of seeds and malt grain (barley) results from:—

(a) Destruction of the germ by the feeding activities of beetles and moth larvae.

(b) Destruction of the endosperm. Even though the germ may be undamaged, the seedling lacks sufficient food to develop.

(c) Heating and high moisture content.

Filth in Manufactured Products

The usual cleaning methods may not remove all of the internal feeding insects from grain which is to be processed into a cereal product. Internal feeding insects which are not removed are ground up during the milling process and the fragments are present in the finished product. Obnoxious odours and off flavours can also be imparted.

Sources of Infestation

Seed may become infested in a number of ways. Insects which attack the stored seeds in New Zealand differ from those which attack the growing crops. Hence seed is infested after harvest. A frequent cause is the use of second-hand sacks that have not been properly cleaned. Grain stores in particular and flour mills also may not be properly cleaned out before fresh consignments are put in. Sometimes new grain is even stored on top of old grain.

The insect pests of stored seeds are rather general feeders. They breed in feed and grain supplies on farms and in nearly every type of dried food storage and other storage places used by man. Migration by crawling or flight of insects from these areas may result in infestation of new seed.

Storing stock and poultry foods in or near the granary is a direct cause of infestation, since these food products are almost invariably infested. Mill screenings which are made available as stock food include much cracked grain, sweepings, and dust which are often infested with several kinds of stored-grain insects and mites. Such material should not be stored for any length of time and certainly not near clean seed.

Preventing Infestation

Before control measures for dealing with existing infestations are discussed it must be stressed that insecticides, however good they may be, can never take the place of good management in the observance of reasonably hygienic conditions. Infestations can be prevented by the following precautions:—

PROPER SEED STORAGE

▲ Good storage of bagged seed, showing space between stacks to allow inspection and treatment if necessary. Bags are raised off the floor by boards, though it is often better to use pallets.

▼ Badly stored grain with no provision for ventilation or inspection. Spilt seed encourages attack by rodents, insects, and mites.

Proper Harvesting

Much insect damage to seeds and grain can be prevented by careful harvesting. Seed harvested before it is dry is subject to sweating and heat damage later. Furthermore, insects will attack grain with 14 per cent. or greater moisture more readily than dry grain, that is, grain with 12 per cent. moisture or less. Therefore, to reduce chances of damage by heating or by insects only dry grain should be stored. Different areas have different climates and so storage conditions and recommendations may vary. Thus in the United States of America, where there are mechanical drying facilities, an upper moisture limit of 12 per cent. for long storage in silos may be recommended. In New Zealand, where grain is air dried, wheat with 15.5 per cent. of moisture is considered dry enough to store in sacks with reasonable safety.

Correct drum setting on the header will lessen the amount of chipped seed harvested. The setting should be checked regularly. Seed should be cleaned before it is stored. The presence of chaff, straw, weed seeds, stems, and broken kernels makes seed more subject to insect attack. Such seed is difficult to fumigate and goes out of condition easily. Good, sound wheat, well harvested, air dried, and securely and safely stored should suffer no damage from weevil or mite in its first 12 months' storage.

Use or Treat Old Stocks of Grain

As old stocks of grain are the principal sources of infestations by moths and weevils, it is a good plan to remove or use old stocks so that storage bins can be cleaned and treated before the new harvest comes in. If old grain must be held over, it should be thoroughly fumigated to kill all hidden infestation.

Do not store old grain with new, as this is the quickest way to get new grain heavily infested.

Clean and Treat Storage Places

Storage bins should be swept clean and free of dust, cobwebs, old grain, and other debris before they are treated. Old bags and material that may be hiding places for insects should be removed. After storage places have been cleaned they should be treated with a 2½ per cent. spray of DDT or 1 per cent. lindane. To

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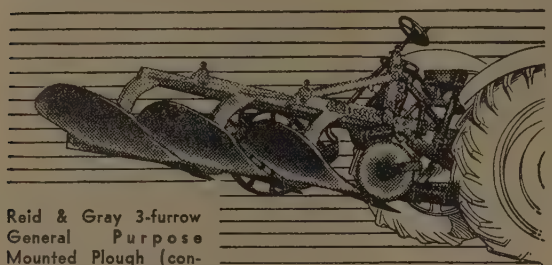

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make a 2½ per cent. DDT spray add 2lb. of 50 per cent. wettable powder to 4 gallons of water, or ½ gallon of 25 per cent. emulsifiable concentrate to 4 gallons of water. Apply either at 2 gallons of spray per 1000 sq. ft. of surface area. Ceilings, walls, and floors should be properly wetted and special attention paid to cracks and crevices in the wood, where storage insects hide.

Good Storage

Where small seeds are stored in bags pest damage can be reduced by using bags spray treated with a 5 per cent. oil solution of DDT. Overseas ½ per cent. synergised pyrethrum (pyrethrum plus piperonyl butoxide) is used, particularly where grains are bagged, but is still rather expensive in New Zealand.

Bagged seed should be stacked on pallets if possible or in a manner which will allow a current of air underneath the stacks, and stacks should be built 12in. from the walls and far enough apart to allow inspection and cleaning. As a preventive measure the floors and walls should be sprayed periodically with a residual spray (0.1 per cent. dieldrin or 2½ per cent. DDT, as for the bins). General recommendations are to:—

(a) Separate stock feed bins and feed rooms as far as possible from structures where seed is stored.

(b) Avoid storing seed in buildings where animals are housed or hay is stored.

(c) Clean up spilled grain, feed, and litter in and around farm buildings to remove the supply of insects which may infest seed.

Control Measures

Physical

Pests flourish where there is no movement of material or disturbance of any kind to interfere with their delicate egg and other immature stages. Grain, particularly where it is held in warehouse bins or silos, should be turned, where practicable, once a month. This also helps to eliminate "hot spots" due to high moisture, caking, or intense insect activity. If at the same time as it is turned the grain is put through cleaning machinery, a large percentage of the pests will be removed with the cleanings.

Insects can readily be killed by heat. If material can be raised to a temperature of 140 degrees F. for 10 minutes, all insect pests and mites in all their life stages (egg, young, and adult) can be destroyed. A temperature of 108 degrees F. will produce the same result if it is continued for several hours. The material must be be raised to these temperatures throughout its bulk, of course. It is inadvisable to apply this treatment to seeds or grains intended for sowing.

Most storage insects can withstand low temperatures and there are no natural low temperatures in New Zealand which are likely to do more than check activity and slow down breeding. Most insects are relatively inactive at temperatures below 50 degrees F., but mites may damage seeds at 40 to 50 degrees F. if the moisture content of the seeds is over 12 per cent. Though cold storage of seed is used for protection overseas, certain precautions must be observed. Seeds removed from cold storage may have a relatively high moisture content and if subjected to high summer temperatures, will deteriorate rapidly. Unless seeds are used immediately after removal from cold storage, they must be carefully dried. Stored seed should be inspected regularly for any sign of infestation.

Chemical

Chemical control may be very effective, but is somewhat expensive.

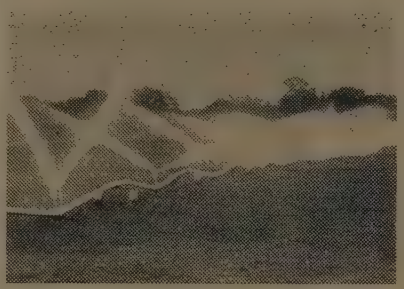
Fumigation is a rapid and, if properly carried out, a completely effective method of destroying insect life in stored seed, but the gases have no residual effect and the seed is liable to re-infestation if it is put back into a contaminated store. Unfortunately many fumigants affect the viability of seeds, particularly if doses are excessive, seed moisture is high, temperature is high, and exposure period is long. To avoid damage and loss of viability due to fumigation seed should be fumigated only if the moisture content is low, about 12 per cent. Seed should be in bags to facilitate aeration, exposures should not exceed 24 hours and preferably should be 12 hours or less, and fumigation temperature should be under 85 degrees F.

Methyl bromide is highly effective as a fumigant for bagged seed. The Plant Quarantine Section of the Department of Agriculture provides a methyl bromide fumigation service in the main centres to firms and private individuals. This service is likely to be greatly extended as facilities improve. The large modern station in Wellington can handle 800 bags of seed, grain, or meal daily. Work on a similar station has been started in Auckland and later there will be one in Christchurch. Small stations are operating in New Plymouth, Christchurch, Timaru, and Dunedin.

Seed spills out the holes and attracts insects which enter the bags through the holes. →

Patches on old bags frequently shelter live insects. ↓

[*Barwell*



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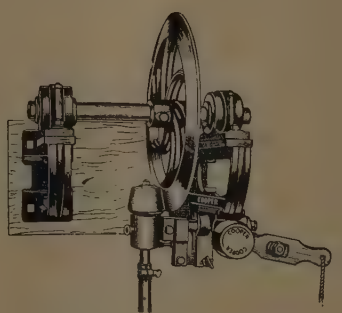

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For space or silo fumigation, hydrocyanic acid, usually as "Cyanogas", has been used at 1lb. per 1000 cub. ft. without damage to germination. Because of danger to human life its general use is not recommended.

Carbon bisulphide plus carbon tetrachloride (1 : 4 mix) can be used at a dosage of ½ gallon per 100 bushels for 24 hours. The seed should then be aerated for 3 to 5 days.

Though carbon bisulphide is explosively dangerous, it has been used for many years by farmers at 1½ gallons per 1000 cub. ft. for 24 hours. Carbon bisulphide and the carbon bisulphide-carbon tetrachloride mix should be sprinkled from a watering can on to empty bags distributed over the top of the bagged wheat. The sides of the stack must be covered with a tarpaulin before application and the top of the stack similarly enclosed immediately after the fumigant is applied. As far as possible the covering to the stack should be airtight.

Precautions

All fumigants are toxic to human beings if they are breathed in in concentrated form.

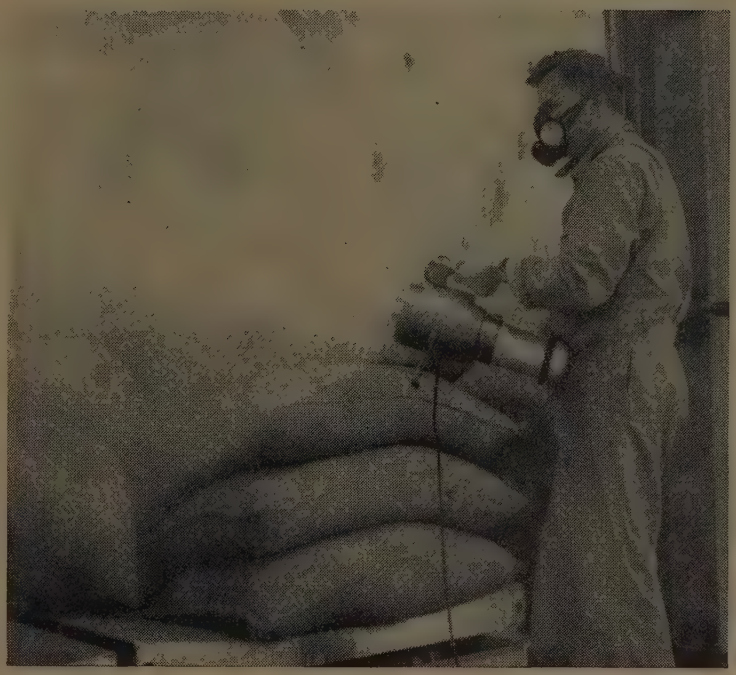
They should be applied only by professional fumigators or people trained in their use and familiar with the precautions necessary to protect themselves and others in the building from exposure to dangerous concentrations. At least two operators, both equipped with gas masks, should do the work.

Insecticides

Insecticides are available as sprays, dusts, smokes, and aerosols. The chief preparations used for control of stored-products pests are DDT and lindane, and dieldrin is coming into prominence. DDT and dieldrin are long lasting, but lindane, though not so long lasting, is quicker acting and particularly useful for control of grain and meal mites.

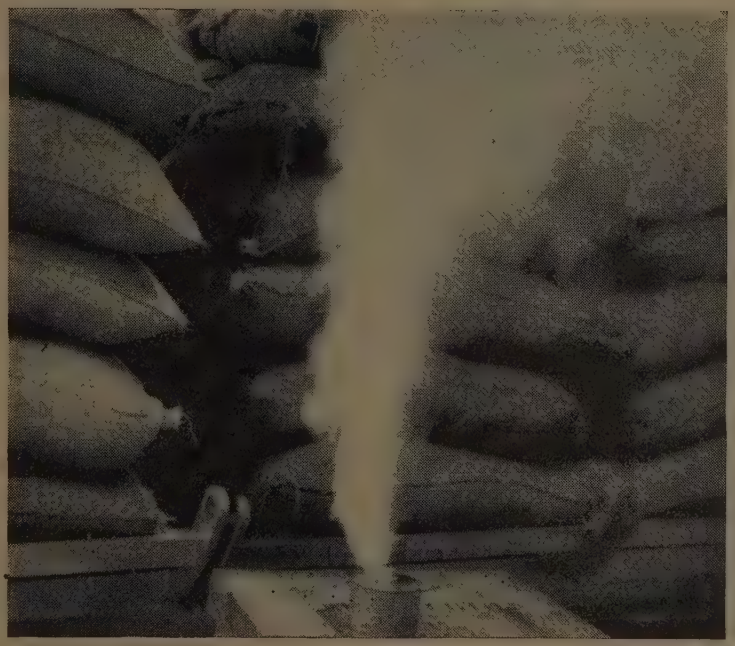
Poisonous dusts are effective regardless of the moisture content of the seed. DDT is best when diluted with a carrier such as pyrophyllite or a similar chemically inert dust. The carrier increases the volume and therefore ensures thorough distribution over the seed. A 2 per cent. DDT dust is effective when mixed with seed at a rate of ½oz. per bushel. Lindane is used as a 1 per cent. dust at ½oz. per bushel.

However, neither DDT nor lindane is completely harmless and both may have some adverse cumulative effect if consumed. Experiments have shown that eggs have been tainted after fowls have been fed with mash treated with lindane. Lindane should not be used on grain destined for poultry feeding or human consumption. However, because of their residual properties



▲ An operator applying an aerosol.

▼ A smoke-dispersed insecticide generator in action.



[*Department of Scientific and Industrial Research*

▲ A hand-operated seed-dusting machine for treating moderate quantities of seeds.

▼ A continuous-action machine of a rotary type used for dusting large quantities of seeds.

[*Department of Scientific and Industrial Research*

DDT and lindane are very valuable for treating storehouses at intervals, particularly when the storehouses are being cleaned out.

Application as sprays is the usual method, but the use of smokes and aerosols is becoming popular because of the ease and speed of application. Smoke-carried insecticide from a pyrotechnic candle has not the penetrating power of the gases used in fumigation and has the disadvantage that most of it is deposited on the floor and only a little on the ceiling and walls.

The main use of an aerosol is in treating spaces and it is of great value in destroying mill moths in the active flying stage. Electrically operated, portable aerosol machines are often used for treating warehouses.

Inert Dusts

Chemically inert dusts (as opposed to active poisons such as DDT) are thought to kill insects by causing breaks in their waterproof, fatty coverings; their body moisture then evaporates through these breaks. The effectiveness of inert dusts declines as the moisture content of the seed increases over 12 per cent. Dusts that have been used for treating seeds include finely divided silica gel, rock phosphates, precipitated chalk, magnesium oxide, and aluminium oxide. Dusts with a particle size of 1 micron or less can be used at about 1oz. per bushel.

A much superior substance to DDT, lindane, or inert dusts has come into prominence overseas, particularly for protecting foodstuffs. It consists of pyrethrins fortified with piperonyl butoxide. Pyrethrins have an extremely rapid paralysing effect on many insects, but frequently fail to kill them, and the insects recover later. The addition of piperonyl butoxide produces a rapid-acting, efficient insecticide. Formulations of this mixture are available in New Zealand. Such an insecticide is quite harmless to human beings and domestic animals and may be used near foodstuffs without harmful effects. When manufacturing costs are reduced this insecticide should become a most economical protectant for seeds.

For grain stores the recommendations are 1 gallon of the pyrethrin-piperonyl butoxide mixture per 2000 sq. ft. as a direct spray or double that amount as a residual spray. Dusts containing 0.05 per cent. of pyrethrum plus 0.8 per cent. of piperonyl butoxide in a talc carrier are excellent for protecting seed which is free from insects when treated. Dosage rates are 1½oz. to 2oz. per bushel (1lb. for 600lb. of grain) and this has been shown under experimental conditions to give protection for 12 months.

Summary

High moisture and high temperature speed up the life processes of seed and shorten the period of viability. These conditions also favour the rapid development of insect pests. To preserve seed and protect it from insect attack during storage keep it cool and dry.

Prompt harvesting when the crop is in condition, followed by drying if necessary and storage in clean, insect-free, weatherproof premises are essential. Bins and warehouses should be thoroughly cleaned and sprayed with a residual spray before being used.

Heating of dry products (but not seed) to 140 degrees F. for 10 minutes destroys insect infestations.

Good hygiene around storehouses will greatly assist in avoiding infestation and will prove far better and cheaper than palliative measures like fumigation and application of insecticides to control infestations once they have occurred.

Fumigation destroys insects, but has no residual effect. Silica dusts, magnesium oxide, pyrethrum dusts, and DDT mixed with seed afford effective and lasting protection from insect attack under appropriate conditions.

Seed or grain treated with DDT and lindane should not be used as food for man or livestock.

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Some Uses of Insecticides on the Farm

Pollinating insects are too important to all farmers to allow the risk of their destruction by wrong or untimely application of insecticides to control pests of pastures and field crops.

Recommendations and Precautions

IT is only fairly recently that farmers have been provided with weapons for the control of the insect pests by which their crops and pastures are affected. Previously, pest control was confined to orchard and horticultural crops, since the treatments, usually arsenate of lead and nicotine sulphate, were too expensive to make their large-scale use economic. This article by C. P. Whatman, Instructor in Agriculture, Department of Agriculture, Ashburton, tabulates the pests commonly responsible for damage on a field scale and summarises the best treatment available for their control. A weapon of this potency placed in the hands of farmers naturally leads to certain dangers which are stressed in the article.

Pests of Established Pasture

THERE is no doubt that pests of established pasture are the ones of greatest economic importance in this country. They annually cause severe pasture damage over considerable areas which makes the renewal of the pasture essential. Not so noticeable, but possibly of even greater importance, is the minor pasture damage which results in lowered production, particularly during the periods of minimum growth. Of these pests the two main ones are grass-grub (formerly called *Odontria zealandica* and now *Costelytra zealandica*) and underground grass caterpillar (*Oxycanus*, commonly known as porina). The first remains underground and lives on the roots of grasses and other plants. Porina lives underground during the day, but emerges at night to graze the leaves of most pasture plants.

Full descriptions of these insects, their life histories, the damage they do, and control measures are contained in Entomological Research Station Publication No. 14, available from the Department of Scientific and Industrial Research.

Treatment

The application of 2lb. per acre of 100 per cent. para para isomer (p.p.i.) DDT will protect pasture against grass-grub attack for 3 years and against porina attack for 2 years. Treatment is best applied in superphosphate at the first topdressing after sowing.

Precautions

DDT at the rate given is harmless to micro-organisms and to worms and mammals. It is necessary, however, to apply it to short, dry pasture or to wait until heavy rain has washed the DDT on to the ground surface before grazing. DDT eaten by animals will not be effective in pest control.

DDT is lethal to most insects and consequently must not be applied to pasture in which white clover or weeds are in flower. Pollinating insects are too important to all farmers to allow the risk of destroying them.

Pests of Newly Sown Pasture, Brassicas, and Lucerne

A large number of insect pests can be responsible for damage to young plants of newly sown pasture and brassica and lucerne crops. Among them are:—

Grass-grub, which frequently destroys young brassica crops, destroys lucerne during the first winter after autumn sowing, and severely affects young grass.

Springtails, which can wipe out brassica crops while still in the seed leaf stage.

Wheat stem weevil, which is occasionally harmful to young grass, wheat, and other crops, and later causes "white heads" in ryegrass seed stands.

Grass-grub beetle, which affects newly germinated brassica crops.

Treatment

Treatment will depend on the pest responsible for the damage. Where damage from grass-grub is considered likely it may be avoided by broadcasting fertiliser containing 1lb. per acre of 100 per cent. p.p.i. DDT before the seed is sown. This is particularly important with autumn-sown lucerne. Surface-eating pests (including springtails and wheat stem weevil) can be destroyed by spraying the crop with 10 gallons of water per acre containing ½lb. of lindane.

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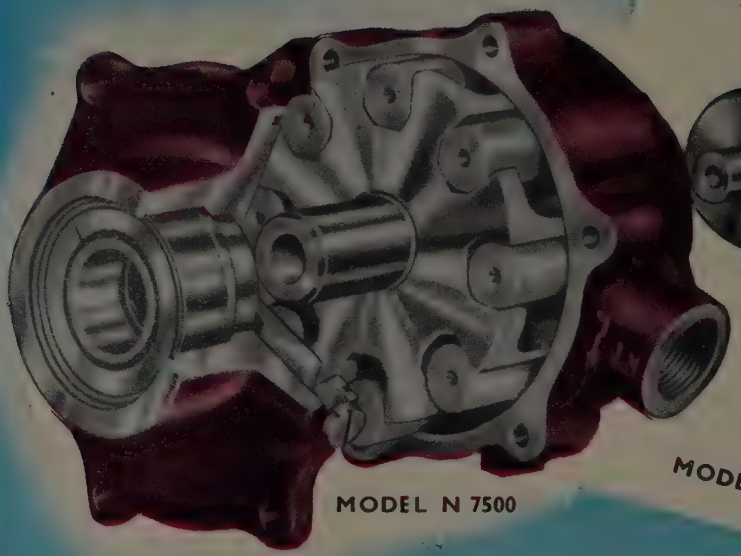

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Swedes untreated (left) and treated (right) with ½lb. of lindane in 8 gallons of water per acre.

Precautions

Since beneficial insects are not likely to be affected by these treatments, no harm is likely to be done. Drilling seed with lindane is harmful to germination. DDT is safe to use in this way, but the maximum protection from the insecticide will not be obtained unless it is broadcast on the surface.

Pests of Grain Crops (Just before Harvest)

The army worm is a surface-feeding caterpillar which reaches its period of maximum destructiveness during summer. It feeds on grass and cereal leafage, but just before the ripening of seed or grain crops it frequently climbs the stalks and either devours the grain or cuts off the heads so that they fall to the ground. A severe attack can practically destroy a good grain or grass seed crop in a few days.

Treatment

Treatment consists of aerial spraying or dusting of the crop with DDT. Where the crop is undersown with grass the most economical practice is to apply 1cwt. per acre of superphosphate containing 2lb. of 100 per cent. p.p.i. DDT. The DDT will destroy the caterpillar, the superphosphate will stimulate recovery of the undersown pasture, and the DDT will protect it against porina (*Oxycanus*) and grass-grub attack for several years. Where the crop, for example, barley, is not undersown the best treatment is probably aerial dusting or spraying with 1lb. of 100 per cent. p.p.i. DDT per acre.

Precautions

No crop can be treated which contains flowering plants being visited by bees or other pollinating insects. Lindane must not be used on grain crops because of possible taint.

Pests of Brassicas for Feed

The feed crops rape, swedes, turnips, chou moellier, and kale are particularly susceptible to a great many pests from the time they come up until after maturity. Those affecting them at the early stages have already been mentioned. The most important of those attacking them later are aphids and the caterpillars of certain insects, mainly the diamond-backed moth and the white butterfly. Damage can be extremely severe, resulting in complete defoliation of the plants and predisposition of roots to dry and wet rots.

Treatment

The very leafy nature of these crops makes it difficult to attain anything like 100 per cent. effectiveness in pest control. Treatment can, however, reduce the severity of the attack, thus enabling the plants to continue growing. In nearly all cases aphid is present in addition to the caterpillars. Since aphids are resistant to DDT, the treatment recommended is ½lb. of lindane per acre. This may be applied in dust or spray from the air or from the ground. Ground treatment is limited to those crops where little damage will be done by the passage over them of spraying equipment. In unfavourable weather a second treatment about 3 weeks after the first will be necessary to maintain control.

Precautions

As stated previously lindane is lethal to nearly all insects. Consequently serious harm can be done when it is used on a crop in which flowering plants (weeds, mustard, etc.) are being visited by pollinating insects. Apart from the direct danger to hives of domestic bees the loss of bumble bees, wild bees, night flying moths, etc., may seriously affect the pollination of red and white clover and other cultivated plants. The poison is lethal for at least 5 days after application, so that to spray or dust on a dull day when insects are not working is no solution to the difficulty.

Lindane should not be eaten by animals. No crop, for example, rape, can be fed off with stock for 2 weeks after treatment.

Pests of Brassicas for Seed

The same problems occur in brassica seed production as in growing these crops for feed. The main damage, however, is done to the crop by aphids at and following the main flowering. In some seasons this may completely destroy promising crops.

Treatment

Elimination of aphids in autumn will reduce spring infestation. Treatment will be as for feed crops, though the high potential value of the seed crop and the need to eliminate rather than merely control any autumn infestation make it advisable to double the quantity of lindane applied per acre in heavy infestations. Spring treatment is difficult, since there is only a short period during which it can be done.

Precautions

No crop can be treated after petal colour begins to show through the calyx of the buds. Bees work flowering brassica crops very vigorously and careless treatment can result in the bee population being seriously affected over fairly wide areas.

Danger to Operator

People vary widely in their tolerance to the chemicals DDT and lindane. In some, inhaling of dust or even exposure of skin to them causes sickness and eczema. Consequently, anyone working with them, for example, mixing or sowing, should take all possible precautions. An industrial mask or even a damp handkerchief held over the nose and mouth will give reasonable protection.

Other chemicals are at times sold for pest control and some of these are much more virulent poisons. No one should work with these materials without finding out the extent to which they are harmful and taking necessary precautions. Some of them should definitely not be used for pest control.

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Harvesting Silage with the Pick-up Baler

By B. A. GUNNING,
Instructor in Agriculture,
Department of Agriculture, Matamata

THE harvesting of excess spring pasture growth as silage has become increasingly popular in the Matamata district in the last 3 or 4 years, mainly owing to the rapid development of improved mechanised methods of harvesting. This revived interest in silage has stimulated many farmers to try other methods of conservation. One method tried, involving the use of the pick-up hay baler, offers advantages in both the harvesting and feeding of the crop.

SOME farmers have been baling silage for three or more years now and have demonstrated their ability to produce good silage by this method.

Advantages

The advantages of this method of harvesting are readily apparent. First, the labour necessary is not unduly great. On the average farm two men can comfortably handle the silage harvest by this method, and this number is no more than is required for ensiling with the buckrake and less than for most other methods.

Another advantage is that much shorter material can be baled than can be conveniently picked up with a buckrake or sweep or front-end loader. This means that a larger area of the farm can be harvested at an earlier stage of growth, giving better silage, less pasture deterioration, and a greater quantity of valuable pasture aftermath for summer feeding.

On one farm in the Matamata district the silage crop baled is really little more than a heavy crop of toppings. The management system adopted here is really an extension of that adopted on many farms where hay is baled. Intensive break grazing during October is avoided, the herd being given enough pasture daily to prevent close grazing. The animals respond well to this treatment, their satisfied appetites being reflected in higher milk yields. The unevenness in the pasture which this system tends to induce is easily rectified by closing paddocks in rotation for a quick cut of silage. A farmer wishing to follow this system, however, would need to possess his own baler, as the machinery will be in use for long periods at a time.

Side raking ensures a clean pick-up by the baler.

On farms which already have a hay baler complement baling of silage means that greater use can be made of the implement and the unit cost of its output will be reduced.

In addition to its ability to pick up short material which is difficult to handle by other means the hay baler can also operate on rough (though not steep) country. A baler can be used under conditions where a buckrake or sweep tends to dig in.

Finally, baled silage has most of the advantages of baled over loose hay as far as handling is concerned. The baling twine does not rot in the silage clamp as is commonly supposed, but is preserved with the silage except at the edges of the clamp or wherever the weather penetrates. This means that it is not necessary to use a knife at all. Bales can be lifted by their strings or the silage can be forked out, as the strings are quite loose owing to the compaction

Baling the crop.

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of the bales during curing in the pit. Estimation of the load at feeding-out time is easier, as the bales can be counted as they are loaded in the same manner as bales of hay. The number of bales contained in a pit should be known where a bale counter is fitted to the baler and the content of the pit or silo can be calculated by multiplying this number by the average weight of a bale. Rationing is thus easier.

These modifications have eliminated most of the tedious work of picking up bales. →

Disadvantages

Baling of silage has its disadvantages and these must be mentioned. Where the area to be harvested is steep other harvesting implements will be found to be much safer to operate and this may be an important factor on farms on rolling country. On farms where no pits or silos are available for storing the bales, silage baling is again not feasible, since bales of silage cannot be stacked above ground without retaining walls. Where a pit or silo is available, however, it is quite feasible to harvest any paddock on the farm, for, as the bales have to be loaded on to a trailer for carting to the pit, it is

The trailer is loaded and will now be taken to the pit. →

little trouble to cart them any reasonable distance.

Cost Factor

The factor which will deter many from baling silage is the cost, as contractors are charging 9d. per bale to bale the silage harvest. To ensile a 10-ton-per-acre crop of grass by this method would thus cost about £12 10s. per acre, which is about the value of the material. This cost is obviously prohibitive. It is considered that farmers should be able to harvest their own silage by buckrake, for example, much more cheaply than this.

Unloading at the pit. →

Neither could it be recommended that a farmer buy a hay baler solely to bale his silage harvest, for in such a case the cost per acre for repairs, maintenance, interest, and depreciation on the baler would be unlikely to be much less than the cost of baling by contract.

Some farmers, however, already possess a hay baler which is used solely to handle the hay harvest on their own farms. These farmers probably realise the high cost of baling

HARVESTING SILAGE WITH PICK-UP BALER

HARVESTING SILAGE WITH PICK-UP BALER

A sloping wall is built to prevent the clamp bursting outward. Later this clamp will be covered with loose material and consolidated with a tractor.

their own hay, but believe that the cost is warranted by their resulting independence of shared or contractors' harvesting machinery. In such cases use of the machinery for the silage crop does not increase the overhead due to interest, and the cost due to depreciation is not much increased, for the major part of the depreciation will be due to obsolescence where the machine is used on only a few acres each year. Again repairs and maintenance costs will be light where the baler works to such low capacity. The cost of baling twine is not as high as it would appear at first sight.

A crop of silage yielding 6 tons of green matter per acre and yielding as hay about 50 36in. 60lb. bales would give as silage about 200 18in. bales each weighing about 70lb. One ball of twine is sufficient for 300 of these half-length bales or 1½ acres of the above crop. With twine at £180 per ton the cost would be about £1 per acre or 1.2d. per bale. To offset some of this cost is the substantially lower petrol consumption compared with that for other methods of harvesting. Thus under these special circumstances baling of silage might be reasonably economic.

Method of Operating

To produce bales of silage it is necessary to make a few alterations to the baler. The most important one is that to ensure the production of half-length bales. For handling hay most balers are set to produce 36in. bales. Silage bales of this length would be too heavy for convenient handling and also would be very prone to buckle. Many balers have provision for considerable alteration to the length of bale produced. If sufficient alteration cannot be made by this means, a double-trip mechanism can be incorporated which causes the needles to operate twice for every complete turn of the bale-length metering wheel. If the alteration cannot be made on the farm, a firm of implement engineers could probably make the alterations for the cost of a few pounds at the most.

On balers with an auger feed mechanism it is sometimes necessary to fit a spring which causes the auger to bear more heavily on the green material to ensure even feeding.

Again, some operators recommend the fitting of a couple of extra feet of flooring in the front of the bale chamber, the removal of the rear wedges and tail board, and the fitting of a roller at the back of the bale chamber; all these alterations are to prevent buckling of the bales. These are added refinements, but many balers are functioning quite satisfactorily without any alterations except that which ensures the production of shorter bales.

The baler is assisted in picking up the material (especially in light crops) if the swaths are side raked first. As an alternative an inside swath board may be fitted to the mower.

These alterations to existing machinery are likely to cost no more than a few pounds, and a few minutes' work will reconvert the machinery for dealing with the hay crop.

Alterations to Baler

The following method of operation is that used by Messrs. A. B. Mossop and I. C. Harris on their Waharoa farm.

The area is mown with a 26 h.p. tractor and mid-mounted mower and side raked immediately with a 16 h.p. tractor and side-delivery rake. The 26 h.p. tractor is then used to operate a small power take-off pick-up baler behind which is towed a specially adapted trailer. Alterations to the trailer are the fitting of a pair of castor wheels (taken from an old set of horse-drawn discs) to the towbar to take the weight of the front of the trailer and a small platform on the towbar on which a man can stand. A chute fitted to the end of the bale chamber conveys the bales to a position where they can easily be lifted by a man standing on the platform.

One man drives the tractor and the other stands on the towbar platform and loads the bales on the trailer. When the load of about 45 bales has been stacked the 16 h.p. tractor is used to tow the load to the pit for stacking. If the work is in a field adjacent to the pit, only 30 minutes are required to bale a load of 45 bales, cart them to the pit, and stack them.

At the pit the bales are stacked neatly, starting at the back of the pit and working toward the entrance. A sheer wall at the pit entrance is avoided, a sloping wall being built to avoid bursting of the wall outward. Over this sloping wall the tractor is later driven to help consolidation. The rate of stacking is regulated to allow time for the mass to heat sufficiently, but if required, the two men can mow, bale, and stack 3 acres per day in 5½ working hours between 9 a.m. and 3 p.m. The material is not wilted before baling. No attempt is made to fill crevices between bales with loose material, but the pit is sealed when full with a few loads of loose material which are swept in and consolidated with the tractor.

The author has inspected silage made in this manner and found it to be of excellent quality at the time of feeding out.

Prevention of Blowfly Strike in Sheep

By P. L. THOMAS,
Parasitologist, Department of Agriculture Animal Research Station, Wallaceville

BLOWFLY strike is caused by the maggots of certain flies which lay their eggs on the fleece of the living sheep. The eggs hatch and the maggots burrow first into the skin and then into the flesh of the sheep. The smell from the strike is extremely attractive to flies and more will rapidly come to the site of the strike and lay their eggs in its immediate vicinity. In a short time if the strike is left unchecked it will rapidly spread to form a large lesion which will cause the sheep extreme discomfort and frequently death will follow.

ONLY two species of flies in New Zealand will commonly initiate a strike. They are *Calliphora stygia* (previously named *C. laemica*), one of the golden-haired blowflies, and *Lucilia sericata*, which is a smaller, bronze-tinted, green fly.

A further fly which frequents carrion and closely resembles *Lucilia sericata* is *Chrysomia rufifacies*. This fly is also attracted to strikes caused by either *Calliphora* or *Lucilia* and may deposit its eggs there. The maggots from this fly, which is termed a secondary fly because of its inability to cause a strike, are hairy in contrast to those of the primary flies, which are smooth. The effect of these secondary maggots on the sheep is frequently far more severe than those of the primary flies alone.

Methods of Preventing Strike

Fly strike can be prevented in various ways. The adult fly can be kept off the sheep or its egg laying inhibited. Many repellants have been tried. Some such as oil of citronella and dibutyl pthalate have been used in docking oils to prevent the wound becoming struck. These are, however, fairly expensive and the effect soon wears off.

DDT prevents the fly from laying its eggs in a different way. It does not repel the fly from the sheep, but by a progressive intoxication process it seems to paralyse the egg-laying organs of the fly. The fly normally takes some time selecting a position in which to lay its eggs and when the fleece has been treated with DDT the fly finds itself unable to lay its eggs by the time it has selected a suitable position. The lasting properties of DDT on a sheep are, however, limited, as this effect lasts only about 5 weeks.

Crutching

A great degree of protection can be afforded for short periods simply by crutching of the sheep and prevention of scouring. The flies which cause strike can breed on food other than the living sheep and strike sheep only when they are in an attractive condition. This attraction can arise from

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different conditions such as a scour-soiled breech, wet and dirty wool, fleece rot, mycotic dermatitis, foot-rot, and possibly other factors less easily recognised. A certain degree of humidity is associated with all of these conditions and the dampness is essential if the maggot is to survive.

Crutched sheep which are scouring and therefore attractive to adult flies are occasionally blown (that is, eggs are laid on the sheep), but the dry conditions resulting from the removal of the wool will prevent a strike. Crutching is not always completely effective and in any event works only until the wool grows.

Dips and Jetting Fluids

The best line of attack is by the use of dips and jetting fluids to prevent larvae from causing a strike. BHC kills maggots when used at sufficient strength, but the period of protection afforded by ordinary-strength BHC dips is very short. For some years now special "fly" dips have been available which contain both DDT and BHC. The DDT gave a degree of protection against the adult flies and when this failed the BHC killed any maggots which did hatch out on the sheep.

The snag with these dips is that the main period of fly activity does not usually coincide with the weeks immediately after dipping. This is especially true in the North Island, where *Calliphora stygia* is the main cause of strike. This fly is active under favourable conditions throughout the year, and sheep may be struck frequently at any time from October until April, the main peaks of activity usually occurring in November, before dipping, or in March, when the effects of the dip are wearing off.

Aldrin and Dieldrin Dips

In the last two dipping seasons dips containing either aldrin or dieldrin have been offered by manufacturers in the areas where blowfly strike is most serious and will this year be available more generally. These dips used at the makers' recommended strength will give complete protection against fly strike from dipping time until fly activity has ceased to be serious.

The action of these two insecticides in protecting sheep, like that of BHC, lies in their ability to kill the maggots before they can cause a strike. Though they cause the death of flies, their action is slow and flies are not prevented from "blowing" on the sheep. A patch of eggs or "blow" on a sheep dipped in either aldrin or dieldrin need not be a cause for concern. If it is closely watched, the eggs will be seen in most cases to hatch and give rise to very small maggots which will succumb to the effects of the dips in a very short time.

Period of Protection

When aldrin and dieldrin dips are required to give solid protection against fly strike for a month after dipping a minimum strength of 0.025 per cent. should be used. If dipping is done after Christmas, 0.05 per cent. will normally give complete protection until the fly season is over, but if dipping is done early in the season

Jetting after tailing in the cradle constructional details of which are shown in the diagram on page 337.

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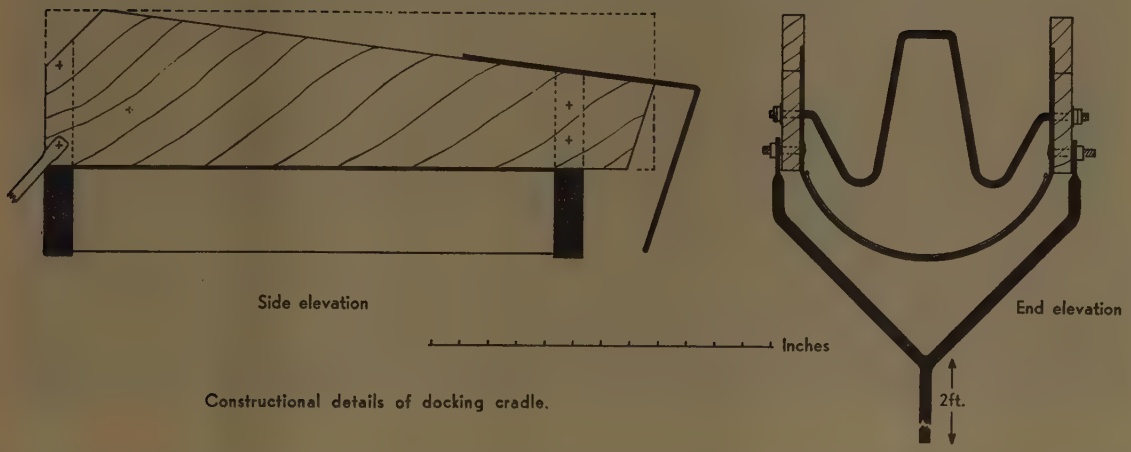

Constructional details of docking cradle.

in an effort to get protection during the pre-Christmas fly period as well as the February-March period, 0.1 per cent. may be required.

It is apparent from the foregoing that post-dipping strike can be completely controlled. Where lambing, shearing, and weaning are done early enough and dipping can be brought forward, this may provide a complete answer, and this is probably so in parts of the South Island where *Lucilia sericata* is normally the predominating species of fly and is not very active until after Christmas.

Pre-dipping Strikes

On many properties, however, it is impossible to dip before fly activity starts to be serious. Strikes due to such activity of the flies in spring or early summer are most frequently crutch strikes. Crutching, tails cut to the correct length, and, if necessary, anthelmintic treatment where worms are causing scouring with all help. However, it is now possible to treat lambs with an insecticide at marking time which will give them protection against crutch strike until dipping time.

Jetting at Marking Time

Jetting can be done by applying aldrin or dieldrin at 0.05 to 0.1 per cent. to the crutch area immediately after castrating and tailing of the lambs.

This is best done by jetting the lambs with a power-operated spray pump. Pumps giving a pressure of 70 to 80lb. per square inch have been recommended to give thorough saturation of the wool, but pumps of the type normally used for gorse spraying working at 40 to 60lb. per square inch are satisfactory provided that the jet is held close to the wool and the liquid bubbled in to get complete saturation.

A nozzle giving a flat fish-tail or fan-shaped jet of wash is necessary. A nozzle delivering a fine spray is not satisfactory, as penetration into the fleece is difficult to obtain and in addition control over the area wetted is difficult and much spray will be wasted on the ground and frequently also over the person holding the lamb.

It is quite possible for the lamb holder after the lamb has been docked to continue holding the lamb while it is jetted thoroughly round the tail and crutch, simply turning it over before it is released to ensure that the tail is completely ringed with insecticide. With care by the spray operator the holder need not get excessively wet, though it is wise to wear gumboots and possibly a stout plastic apron.

Alternatively a shield of corrugated or sheet iron may be attached to the docking race behind which the holder can stand. Where docking cradles are used treatment is even more simple and no one need get wet.

A simple cradle which can be made by a handyman and which is ideal for the purpose is illustrated above. Similar cradles, usually with patent attachments to make docking and handling easier still, are made by commercial concerns.

Amount of Spray

About 2 pints of wash are required to treat each lamb thoroughly, though it is probably wise to allow for up to ½ gallon per lamb in calculating requirements for the first time, as a new operator is likely to give the animal "a good doing" to make sure. Even at this rate the cost should not be in excess of 4d. per head, which is equal to the cost of one dose of phenothiazine, and the subsequent saving in time, labour, and damaged or lost sheep will usually more than justify this outlay.

If it is deemed necessary to crutch spray sheep other than lambs before the general dipping time, the same jetting fluids can be used. The sheep may get excessively dirty if they are jetted in a race or pen, and the job is best done in the woolshed, where the gratings will allow excess wash to drain away.

If a shower dip is not available, jetting can also be used to apply insecticide as a protection against body strike, approximately ½ gallon per sheep being applied in a single wide band down the middle of the sheep's back. Jetting is unnecessary on freshly crutched or shorn sheep, as strike on such sheep is abnormal.

Strike Dressings

In the treatment of sheep already struck dressings which would kill the maggots have been used for years past. Kerosene alone will do this, but it is very irritating to the skin and the wound will not heal quickly, with the result that the sheep may become restruck.

Soothing dressings which killed the maggots and promoted healing have also been available, but in areas where fly activity was high they gave very limited or no protection against restrike. Dressings containing BHC and DDT which were indeed very efficient, have now been available for some years, but even they failed to give protection against restrike in every case.

Now special dressings containing either aldrin or dieldrin are available which will meet every requirement. They will kill the maggots, promote quick healing, protect against restrike for several months, and will not stain the wool.

Research has shown that the addition of BHC to either aldrin or dieldrin dressings is an improvement, as the BHC drives the maggots out of the wound, whereas either aldrin or dieldrin alone tends to kill the maggots where they are and with a deep wound, particularly where secondary maggots are present, this may delay healing.

Some dressings incorporate special germicides and healing agents, but in an emergency excellent results will be obtained by use of either 0.1 per cent. aldrin or dieldrin as it is prepared for jetting purposes. However, these dressings will not prevent the flies laying their eggs in the treated area, but no maggots will survive after hatching and the presence of blow does not mean that retreatment is going to be necessary.

Head Strike on Rams

A further use for these jetting fluids is for preventing strikes on rams' heads which frequently occur through wounds received in fighting during flushing and the beginning of the tupping period. For this purpose the heads of the rams should be well soaked in jetting fluid of 0.1 per cent. strength.

The reduction of flies in an area is always difficult and carcass disposal by burying does not always prevent flies from breeding in it. Burning must be thoroughly done to be effective. Again the new jetting fluids will prove useful. A dead sheep sprayed with aldrin or dieldrin will continue to attract flies, but all the maggots will be killed. Such a carcass after treatment can be safely buried and this should be done. To leave the carcass as a trap is unwise, as even though it may cause the death of many flies and maggots, it may be the means of perpetuating or spreading other diseases.

Dips should be chosen carefully. There are aldrin and dieldrin dips which will not, and are not intended to, give these prolonged periods of protection against fly strike. They are intended for use on properties where fly strike is not a serious problem and will give better control of lice and keds, plus a certain degree of protection against blowfly strike which was not given by ordinary lice and ked dips.

The makers' directions should be followed carefully and the sheep should be dipped thoroughly. The dip manufacturers' instructions on the strength of the dip necessary to give the period of control required should be read carefully. There is no point in dipping sheep near Christmas in 0.1 per cent. aldrin or dieldrin when they are to be sent to be killed at the end of January.

Spray Dips

The relative advantages and disadvantages of spray or shower dips and plunge dips will not be discussed in this article, but a shower dip working properly will deal with the same number of sheep as a plunge dip with less effort and in a shorter time; the sheep should therefore not be rushed through showers. One minute in a bath is adequate, but in a shower 4 or 5 minutes is not excessive. This period should be timed.

When the machinery is doing the dipping and the dogs are holding the sheep in the pen ready to refill the shower, 5 minutes will seem like half an hour to the man who is operating the shower. Attempting to shower dip sheep too quickly is the principal reason why complaints are heard about shower dips.

Methods of applying aldrin or dieldrin washes other than by jetting are definitely not to be recommended when lambs are being treated at docking time. Immersing the lambs' hindquarters in a bath of wash may lead to bacterial infection of the wound when the wash gets dirty. No bactericide is known which will keep the wash sterile under these conditions.

Swabbing is also risky unless the swab is kept extremely clean (which is practically impossible) and fresh wash is used all the time. These last methods have been widely used, frequently without harmful results, but anyone using them should realise that the possibility of running into trouble is great. Even when jetting is done no attempt should be made to catch the drainings for reuse when freshly docked lambs are being treated.

Lice and Keds

Lice and keds also are controlled by any dip marketed in New Zealand specifically for blowfly control. The insecticide strength of these dips, whether they contain BHC, DDT, aldrin, or dieldrin, is far in excess of the strength needed to kill lice and keds alone. They will also give the sheep protection from reinfestation for several months should they come into contact with infested sheep. This applies to dipping and shower or spray dipping. Jetting is not to be regarded as a substitute for over-all treatment for the prevention of lice and keds.

Heading photograph by National Publicity Studios.

Grading System Ensures that Export Dairy Produce is of High Quality

THE work of dairy produce grading in New Zealand is highly organised and during the past 50 years a system has been developed that is designed to ensure as far as possible that the dairy produce exported—whether butter, cheese, milk powder, or casein—is of high quality and true to grade.

The grading work is done by a staff of Dairy Produce Graders of the Department of Agriculture who are drawn from the ranks of dairy factory managers. Grade certificates, more familiarly known as grade notes, are issued for each consignment received from a factory, and each package in the consignment is finally stamped with the grade as determined on inspection.

These certificates, which originally were intended as a means of advising manufacturers of the standard of quality in the produce, now serve two purposes. First, the dairy factory manager interprets the grade score on the certificate and, if necessary, alters his manufacturing methods to correct errors and improve quality.

Secondly, the certificate has now become a document used by the trade as a means of establishing the volume of the produce offered and the quality of it. These certificates are accepted overseas without question, and such is the reputation of the grading system that all sales of the Dominion's produce are negotiated on the basis of the quality standards applied in New Zealand.

In the grading of butter and cheese in particular, and to some degree with both milk powder and casein, where the quality is judged on the senses, a Dairy Produce Grader must therefore not only possess a sound knowledge of manufacture but have a keen and sensitive palate.

The grading of produce on the senses calls for skill and judgment, but other tests applied—also as a means of determining or confirming grade classifications—are more objective, and purity and composition standards requiring analysis and laboratory examinations are an important part of the routine grading work.

Dairy factory managers who wish to take up positions as Dairy Produce Graders should discuss the matter with the local Dairy Instructor or apply to the Director, Dairy Division, Department of Agriculture, P.O. Box 2298, Wellington.

[*Sparrow*

Breeding and Management of Small Flocks of Ducks

By M. E. WHITE,
Poultry Instructor, Department of Agriculture, Levin

DUCK raising can be conducted very successfully either as a side-line or as an adjunct to other branches of farming. As a full-time business, however, it requires capital and wide experience. Keeping of ducks in built-up areas is definitely not recommended. The cost of feeding the growing ducklings and of maintaining the breeding stock during the rest of the year must be considered, as during this time there is little return for eggs and the cost of production is high. The beginner should start in a small way and extend as he gains experience. Ducks can be raised at a profit on the general farm and, though perhaps not so great a source of income as fowls, add variety to the table.

A SUITABLE site for keeping ducks is a gentle easterly or north-easterly slope with light sandy soil and sufficient land for the growth of green food. Shade is essential and the birds should be protected from cold winds. Ducks lay their eggs in the morning, and they should therefore be kept confined to their houses or pens until 9 a.m. or 10 a.m., thus ensuring that all eggs will be laid in the houses or pens. Sawdust, straw, or other litter makes a fine bedding material during the laying season and helps to keep the eggs clean. Birds usually begin to lay when they are between 5 and 5½ months old.

Ducks and fowls should not be run together. Ducks when handled should be picked up by the neck rather than the legs, as the legs are apt to break easily. Cleanliness and strict attention to detail are necessary for complete success in duck keeping.

Breeds

With the exception of the Muscovy, all commercial breeds of ducks are said to have originated from the mallard or wild duck. There are two general classes, the meat class, which includes the Aylesbury, Pekin, Rouen, and Muscovy, and the egg class, such as the Khaki Campbell and the Indian Runner.

Aylesbury and Pekin: These breeds are the most popular of the heavy varieties and are suitable for table use. Pekin ducks because of their yellow flesh are generally crossed with an Aylesbury drake, a cross which matures quickly and grows large, with flesh of a good flavour, colour, and texture.

Muscovy: These ducks and crosses of them with Pekins or Aylesburys have very deservedly acquired a reputation for table purposes. When fattened and dressed they are very attractive. Muscovy ducks are quiet and do not run about much or lose condition by excessive exercise. They are good sitters and careful mothers. There are two general varieties, white and coloured.

Khaki Campbell: The Khaki Campbell was produced by mating a Rouen drake with a fawn and white Indian Runner duck, some wild duck blood being introduced later. This breed has excellent laying qualities, as has been proved in egg-laying competitions both in Australia and England. Individual ducks have laid over 300 eggs in a year.

Indian Runner: This breed is noted for its laying qualities. There are three principal varieties, the white, the fawn, and the fawn and white. Though the quantity of flesh on them is not nearly equal to that on the larger breeds, a well-fattened Indian Runner is very fine eating. Where only a few ducks are required for the farm or in the orchard this breed is very suitable.

Accommodation

The site for the house must be dry, well drained, and raised a little above the ground. The building and pen should be constructed on labour-saving principles. An open type of house or shelter is quite suitable in warm and sheltered positions, but in colder districts affected by winds, frosts, and driving rain the ends and back should be covered.

In places where vermin or stray dogs may be troublesome the open portion of the shelter should be surrounded by ½in. wire netting, as rats and dogs can disturb the ducks to an extent where the birds or their production may be seriously affected. About 4 sq. ft. of floor space per duck should be allowed for in the sleeping quarters. An earthen floor is most suitable. This can be constructed of clay, well rammed down, and either covered with straw or wood shavings, which should be added to or replaced when they become dirty and matted.

No perches or nest boxes are required for ducks. Wire netting 3ft. high can be used to confine ducks within their yard.

Breeding

Satisfactory results are obtained by mating ducks of from 2 to 3 years old with a drake between 1 and 2 years old. The male birds used

[*Sparrow*

The Pekin duck is primarily a table bird, but will lay well. The curled tail feather and voice distinguish the drake from the duck.

should be selected from a high egg producing strain. The strongest ducklings are produced from eggs of well-matured, strong, and vigorous stock. The ratio for mating should be one drake to three ducks in heavy breeds and up to six in lighter breeds. Ducks in breeding pens should be kept strictly to themselves and comfortably housed in cold weather to ensure a normal egg supply, but should not be forced in any way.

Incubation and Hatching

Ducklings can be hatched successfully in incubators under the supervision of skilled poultrymen. They can also be hatched under hens and brooded in the same way as chickens. The same general principles apply to the incubation both of duck eggs and those from fowls, though with duck eggs it is usual to run the incubator at a temperature about 1 degree lower than that necessary for hen eggs. The directions supplied by the maker of the incubator can be followed.

In localities with a dry atmosphere the humidity in the machine must be increased either by wetting the floor of the incubator room or supplying extra moisture in the machine. Eggs should be turned twice daily from the third to the twenty-fifth day inclusive and the direction of the tray should be reversed each time the eggs are turned.

The time needed for the eggs to cool depends on the temperature of the incubator room and the day of incubation. A general plan is to leave them out of the incubator for 5 minutes daily for cooling during the first week and up to 25 minutes per day in the last week but not after the twenty-fifth day, as the incubator should then be left closed until the ducks hatch. The eggs should be tested on the seventh and twenty-first days and those infertile or with dead germs removed.

The reversing of the trays and cooling period for eggs applies when table top incubators are used.

All breeds, with the exception of the Muscovy, which requires an extra week, hatch in about 28 days. Muscovy eggs are usually hatched under the ducks. All that is needed to make a nest for the Muscovy duck is to place in a convenient position a box or small cask containing a little sand and litter. The duck will complete her own nest. Aylesbury, Pekin, Khaki Campbell, and Indian Runner ducks rarely sit; if natural methods of incubation are to be used, their eggs may be hatched under Muscovy ducks or hens. This is a satisfactory method for the beginner and where small numbers are being hatched.

Rearing

Ducklings can be reared successfully either naturally or artificially. Regardless of the brooding method, it is advisable to pay careful attention to the ducklings, particularly when they are very young.

When natural brooding is used the broody hen or duck and her family must be protected from the weather and vermin. A coop with a wire netting run attached should be provided to confine the ducklings to a small area for the first few days. An additional run may then be provided or the ducklings with their mother may be allowed open range. However, it is advisable to return the hen and family each night to their coop as a precaution against attacks by vermin.

Muscovy ducks are best reared with the mother duck until they are from 3 to 4 weeks old.

Feeding

Young ducks grow rapidly and during their early life should be given several small amounts of moistened mash daily. The mash can be fed in shallow dishes or troughs or on boards. Adequate feeding space should be allowed, as otherwise timid birds are deprived of their full rations. When the ducklings are from 10 to 14 days old they may be given three feeds of mash daily.

There are several satisfactory mixtures for duck mashes and one often used comprises No. 1 standard chick mash with the addition of 5 to 8 per cent. of dried milk powder. This mash is suitable for ducks during their first 8 to 10 weeks. After this the protein content of the mash can be reduced gradually by omitting the milk powder. Later a growing-bird mash comprising half No. 1 and half No. 2 chick mash may be provided. (No. 2 chick and laying mashes do not contain meat meal.)

Grain can be introduced when the ducks are about 8 weeks old and may be fed in troughs ad lib. When grain is provided only two mash feeds are necessary, one in the morning and the other during the afternoon.

Adult ducks require a higher protein diet than growing birds and when they are on the point of production a No. 1 standard layers' mash can be given twice daily in conjunction with wheat. During winter an additional 5 to 8 per cent. of meat meal should be added to the mash, but this meal can be reduced in spring. Ducklings and adult ducks should have the food supplemented with a fish feeding oil or emulsion at 1oz. to each 10lb. of total food or in accordance with manufacturers' instructions. The oil is of particular importance when greenfeed is short or of doubtful quality.

Clean water must be kept continuously before the birds and should be deep enough to enable them to keep their eyes and beaks clean. If ducks are allowed to go without drinking water for even a brief period, they are likely to become overheated, and later when water becomes available they may drink an excess of it, develop staggers, and die from cramp.

Diseases and Parasites

Compared with fowls, ducks are relatively resistant to disease. An interesting aspect is their resistance to internal parasites, respiratory disease, and fowl pox, which means that in the rearing of ducklings there is less risk of losses than with other poultry.

Recommendations for the

Control of Insect Pests on Brassica Crops in New Zealand

By A. D. LOWE,
Entomological Research Station, Department of Scientific and Industrial Research, Ashburton

EXPERIENCE has shown that wherever brassica crops (rape, swedes, turnips, and chou moellier) are grown in New Zealand considerable trouble is given by insects. Though some plantings may escape infestation completely each season, surveys show that about half of all plantings suffer moderate to severe damage each year, the proportion varying with districts and seasons. Not only are the adult plants attacked, but seedlings are frequently destroyed. The Entomology Division at Ashburton has recently undertaken to survey the problem and suggest remedies. The ineffective control given by parasites and predators in certain areas has led to experiments in chemical control by some of the newer insecticides. Methods of application, both aerial and ground, have also been examined. The recommendations which follow are based on experimental work supplemented by wide observation.

Because of the urgent nature of the problem and the large number of commercial remedies being offered, these recommendations are issued as a help to those seeking control; particular attention has been paid to the conservation of parasites and predators already present in the field.

Insects Damaging Seedlings

Destruction of brassica seedlings by insects has usually been blamed on the grass-grub beetle (*Costelytra zealandica* White), and planting dates have been arranged to avoid the period in November when large numbers of this insect are present. In spite of this, damage to seedlings has continued from as early as September, in rape, to mid-January, in late plantings of turnips. Autumn-sown seed crops have also been damaged. Nightly surveys of many crops have shown that at least four insects may cause this damage. Those chiefly involved are:—

Springtails: These are minute (up to the size of a pinhead), soft-bodied, springing insects, which eat the seed leaves and growing point of the plant just as the true leaves begin to appear (1). At times these insects are present in colossal numbers. Careful observation at ground level is needed to detect them. Their colour varies from inky blue to yellow or pale green. Several species are present, *Bourlettiella hortensis* Fitch being regarded as the commonest.

← Brassica springtail greatly enlarged.

Brassica seedling damaged by springtails. →

Weevils: Two species about ⅛in. long eat brassica seedlings. Weevils are insects of the beetle family. The insect has a hard back and the forepart of the head is elongated into a kind of snout, which gives a characteristic appearance. The two weevils causing damage are *Catoptes* sp. and the wheat-stem weevil (*Hyperodes griseus* Hust.), the adult of which will feed on many green plants. Both are brownish to grey, though when taken in the field they are often coated with dry soil, which gives a grey colour. Both live in crevices in the soil during the day and emerge to feed only after dark. They eat the young leaves or chew through the stem at ground level, causing total collapse of the plant.

Catoptes sp. weevils → (about four times natural size).

Hyperodes griseus → weevils (about four times natural size).

Adult beetle of the grass-grub: This causes major damage. The beetle is shiny, hard-backed, brown, and about ½in. long. It is known popularly as the "turnip fly" because of its extensive damage to brassica seedlings. Those who sow turnips in paddocks ploughed from old, grub-infested pasture may expect damage from the beetle. It is on the wing in large numbers during November. A popular conception is that if planting dates are arranged outside this period, damage will be avoided. To some extent this is true, but extensive biological studies by Kelsey (2) have shown that the beetle may be present in considerable numbers up to mid-January. This has been confirmed in field studies, beetles having been observed damaging young crops as late as the third week in December.

Technical Inquiries

Any technical inquiries about matters raised in this article should be addressed to:—

The Officer in Charge,
Entomology Division,
Department of Scientific and Industrial Research,
Ashburton.

Several other insects are often present and may cause some damage. Wireworms and cutworms cause damage periodically, and thrips, bronze beetle, and various caterpillars have been observed in considerable numbers on paddocks of young brassicas in Canterbury, though no major damage appeared attributable to them.

The insect commonly known as wheat bug (*Nysius huttoni* White), which is almost everywhere present in large numbers, has been widely reported as doing severe damage to brassica seedlings in North Canterbury. The author, however, has never seen such damage and feels that damage may have been attributed to the wheat bug without adequate observation during darkness to discern what other insects may have been present.

Insects Causing Major Damage to Growing Crops

The three insects responsible for major damage to growing brassica crops are:—

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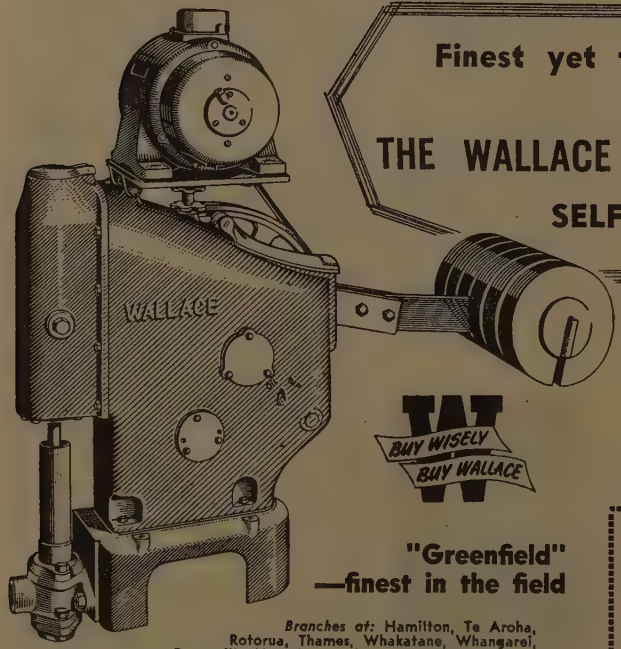

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White butterfly caterpillars (left) and diamond-backed moth caterpillars (right), both natural size.

Left—Brassica leaf damaged by caterpillars of diamond-backed moth. Right—Diamond-backed moth at rest, showing the light-coloured pattern along the back.

Aphids

Several species of aphids frequent brassica plants, the chief one being the cabbage aphid (*Brevicoryne brassicae* L.). This species is characterised by a grey, mealy appearance and is known commonly among growers as "the blight". It belongs to the family of insects popularly called greenfly.

After dispersal flights by winged forms (alates) in spring or early summer individual females produce large colonies of wingless offspring (apterous forms). Continued reproduction within these colonies leads to an enormous build-up of insects until they literally cover the foliage. Under these conditions, especially with the onset of hot weather, plants collapse and are almost useless as feed.

Aphid damage is particularly severe on rape, a plant which has to mature during hot weather when it is to be used for lamb fattening. Though aphids also do much damage to swedes, this crop can often make considerable growth between March and June after the worst of the aphid attack is over.

It cannot be too strongly emphasised that it is almost impossible for a plant to recover from a bad attack of aphids. This points to the necessity for early treatment in infestations by this insect.

Other species of aphids commonly found on brassica crops in New Zealand, as listed by Cottier (3), are *Myzus persicae* Sulz. and *Lipaphis erysimi* Kltb.

Aphids on seed crops are a special problem and assistance should be sought from local Instructors in Agriculture in dealing with them.

Diamond-backed Moth Caterpillar

The caterpillar of the diamond-backed moth (*Plutella maculipennis* Curtis) is a world-wide pest of crucifers. The activities of this insect in New Zealand were described by Robertson (4). The moth lays its eggs on the brassica foliage. As soon as the caterpillar hatches it mines in the leaf and later emerges to feed on the surface, leaving characteristic "windows" in the foliage consisting only of the outer leaf skin. These soon develop into holes and later the caterpillar eats further holes, finally giving a shot-hole appearance to the leaves. In advanced stages of attack damage caused by this insect may completely remove the green material from the leaves, resulting in a netted appearance. Under dry conditions severely affected leaves turn brown.

The caterpillar is small, green, and about ⅜in. long. When disturbed it moves rapidly backward and drops from the leaf to hang suspended on a thread. The pupa lives in a white network cocoon about ½in. long on the underside of the leaf. When the adult moth emerges it is characterised by a diamond-shaped pattern along the wings when at rest. The moth, which is greyish to brown and under ½in. long, flies mainly toward dusk with a short, quick, darting movement.

White Butterfly Caterpillar

The white butterfly (*Pieris rapae* L.) is another well-known pest of crucifers in New Zealand, having been accidentally introduced to this country before 1930 (5). The caterpillar eats large, ragged holes in the leaves of cruciferous plants. It is also green, but larger than the caterpillar of the diamond-backed moth. It is up to 1½in. long and may be identified by three fine, sulphur yellow lines, one running lengthwise on each side of the body, and one along the top of the body.

The caterpillars can pupate almost anywhere, and frequently leave the plant for this purpose, the pupae being found on posts, gates, walls, and twigs. Though the pest normally winters in the pupal form, some caterpillars have been seen continuing on plants in the face of frosts of over 10 degrees, and more than 50 were collected from a small area of cabbages on 1 July in Canterbury.

Some other insects, including thrips, grasshoppers, and various caterpillars, also frequent the foliage of brassica crops, but are not usually responsible for major damage. The common grass-grub will frequently attack the roots of these crops. Young plants suffer severe damage, though older ones can withstand attack if grub populations are not too heavy.

BIOLOGICAL CONTROL

Little is known about the natural control of the insects affecting the seedling stages of brassicas. With the information available at present it is considered that chemicals offer the only reasonable method of control. On the other hand, considerable control of all insects affecting the growing plants is exercised by parasites and predators.

Aphids are fed on by both larvae and adults of ladybirds, the maggots of hover flies, and by lace-wing flies. They are also parasitised by tiny, black, wasp-like insects. A fungous disease kills large numbers under warm, moist conditions and frequently accounts for a dwindling of aphid populations once autumn rains fall.

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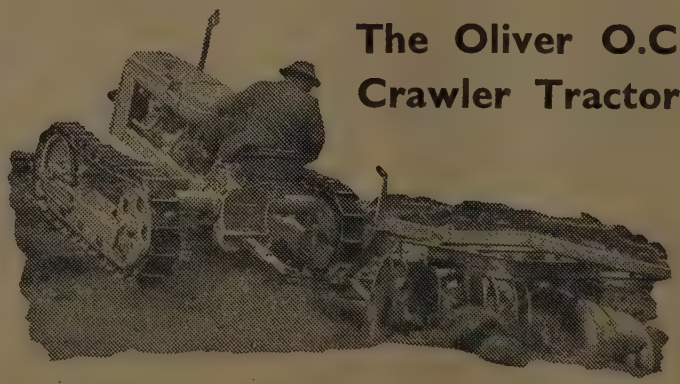

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There are several parasites of the diamond-backed moth caterpillar, and in autumn this stage of the insect is also attacked by a fungous disease. Control by these biological enemies is usually too late to save crops.

White butterfly also has its natural enemies. Probably the most effective of these is the pupal parasite *Pteromalus puparum* L. It is also attacked by fungous and virus diseases, both of which exercise considerable control late in the season. The total amount of damage attributable to the white butterfly varies with seasons and districts, but there is no doubt that on occasions its control by biological enemies is not all that could be desired by the farmer.

RESISTANT PLANTS

One of the most profitable ways of combating insect attack on field crops is by sowing resistant strains of plants. So far the only resistant brassica plants available are the varieties of swedes known as N.Z. Calder and N.Z. Sensation. These were developed by research workers to suit New Zealand conditions, and certainly resist the attacks of aphids.

Many farmers have developed the habit of sowing a mixed stand of swedes, and it is common in some areas to find Superlative, Grandmaster, or Wilhelmsburger, or a mixture of these and other varieties, growing with resistant types. Many such plantings under both irrigated and non-irrigated conditions have been inspected and **there is not the slightest doubt that resistant varieties are damaged less by aphid populations than are other varieties.**

The leaf of resistant varieties continues to grow and remain a healthy green when other varieties have collapsed completely from aphid attack. It is possible, too, that in mixed plantings the non-resistant varieties act as a reservoir from which other plants are continually re-infested. One of the first steps, therefore, in combating aphid attack on swedes should be the sowing of resistant varieties. Farmers living in areas commonly subject to aphid attack and who have not tried these varieties would do well to test their suitability under local conditions. The Crop Research Division of the Department of Scientific and Industrial Research at Lincoln is now developing a rape strain resistant to aphid attack. It is hoped to have seed of this variety available to farmers within a few years.

So far no work has been undertaken on varieties of crop plants resistant to caterpillar attack.

CHEMICAL CONTROL

Under present circumstances it has seemed wise to investigate control by chemicals and to issue tentative recommendations to growers of brassica crops. A large number of preparations is being offered commercially in various forms at different dosages, and the suggestions which follow are intended to act as a guide to those troubled with infestations of any of the insects already mentioned.

From home garden practices lindane or DDT is known to control both white butterfly and diamond-backed moth caterpillars. Lindane or nicotine sulphate will control aphids. Of the insects attacking the seedling stages of brassicas, DDT or lindane is known to control grass-grub beetles (2). Laboratory work has shown that these materials will control both the types of weevil named earlier, but Cleland (1) has shown that in field experiments only lindane controlled springtails.

With these facts in mind it was decided to conduct trials with lindane and DDT preparations at various dosages and with all available equipment to discover which preparations would give control at a reasonable cost for brassica crops. Because more than one application of insecticide may be necessary to control aphids on crops which may stand for several months, a preliminary aim was to find a treatment which would cost not more than £1 per acre for materials. A method of application in which the farmer's own machinery is used cuts costs, but as several commercial methods, particularly aerial application, were likely to become popular, it seemed desirable to evaluate these methods also.

Field-application Factors

The whole problem is somewhat more involved than the normal home garden one of spraying cabbages to keep them free of insect pests. As the home gardener uses from ½ pint to 2/3 pint of spray per square yard (200 to 400 gallons per acre), he is not unduly worried by the cost of his insecticides. He can spray as frequently as desired and can arrange applications to avoid hazards associated with residues.

Again, treating of crops on a field scale is something new in New Zealand. Thousands of acres were treated during the last two seasons with many different preparations and by various methods, and some mistakes are bound to have been made. Nevertheless, the writer, who laid down some 30 different trials and inspected over 150 other treated crops, feels that much valuable work has been done and that the recommendations which follow represent a reliable guide.

In the experimental work carried out certain principles were observed in the selection of materials and dosages. One of these was to reject all materials which may be particularly dangerous to operators or to stock. These included most of the organic phosphate and systemic insecticides. Not only can satisfactory results be obtained with the safer materials lindane and DDT, but other potent yet safe insecticides are becoming available and can be used in further trials without risk to anyone involved in spraying work. The risky materials referred to above are also much costlier than those recommended.

Another principle to be observed in chemical control is the preservation, if at all possible, of beneficial species of insects already exercising some, though perhaps insufficient, control. This is the reason for the low dosage of lindane recommended later in this article. Field trials showed, for instance, that at the dosage advised lindane will not kill many of the ladybirds which feed in huge numbers on aphid infestations.

The need for safeguarding useful insects also led to the early elimination of nicotine sulphate from trials against aphids. This material caused immediate and heavy mortality of ladybirds and, moreover, did not give good control of aphids. In fact, in one small plot trial against aphids on swedes the nicotine sulphate plots were actually in a worse condition at the end of the trial than the plots receiving no treatment, probably due to the action of this insecticide in killing off the beneficial insects.

For the same reason it is imperative that DDT should not be used against aphid infestations. This insecticide has little if any effect against the damaging stages of this insect and only adds to the problem of control by killing off many of the natural enemies of aphids.

Recommendations

On the evidence from trials the following recommendations are made for practical control of the insects already mentioned. Information is summarised in Tables 1 and 2.

Damage to Seedling Plants

Most growers are aware only that plants are being damaged or are disappearing. They do not usually know which insects are present. Under these circumstances the only safe course is to use lindane, which kills all insects affecting crops at the seedling stage.

The dosages should be equivalent to ½lb. of 100 per cent. lindane per acre. Insecticides are sold in various formulations and strengths and it is necessary to convert 20 per cent. or 40 per cent. preparations to equivalent dosages of 100 per cent. strength. Several good materials are available and the formulation chosen should be that most suited to the type of equipment available. Further advice is given on this point under "Preparations and Methods of Application".

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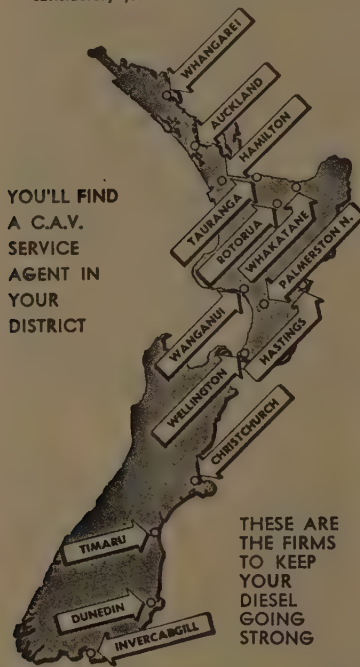

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*TABLE I—INSECTICIDES AND DOSAGES FOR CROPS AT DIFFERENT STAGES

Insecticide	Dosage	Insects controlled	
		Seedling stage	Growing crops
Lindane	Equivalent of ½lb. 100 per cent. per acre	Springtails	Aphids
		This insecticide will also control the insects listed below and should always be used if aphids are present. It is more costly per acre than DDT.	
DDT	Equivalent of 1lb. 100 per cent. p.p.i. per acre	Grass-grub beetles Weevils	Caterpillars of white butterfly or diamond-backed moth

* Select from the table the material suitable for killing the insects attacking the crop affected. Then select a preparation suited to the equipment to be used.

Should the grower know definitely that grass-grub beetles are causing the damage, DDT may be used to control them at the rate of 1lb. of p.p.i. DDT per acre.

Damage to Growing Plants

(a) When caterpillars only of either diamond-backed moth or white butterfly are present **without aphids** 1lb. of p.p.i. DDT per acre will give good control. This treatment should be used only if a grower is certain that aphids are not present in the crop.

(b) When aphids are present use lindane at a rate equivalent to ½lb. of 100 per cent. per acre. This applies whenever aphids are present, either alone or in association with diamond-backed moth or white butterfly caterpillars or both caterpillars. Lindane will control all three insects.

The cost of ½lb. of 100 per cent. lindane varies with the type of preparation used, and several good preparations are available. A choice should be made to suit the type of application equipment available.

Lindane will kill all the insects attacking brassicas, whether at the seedling or more mature stages. The reason for recommending the use of 1lb. of DDT in certain cases is that DDT costs less. Several good DDT preparations are available and choice is governed by equipment available.

Damage to Crops Sown with Grass

Where crops of rape or turnips have been sown with grass and DDT has not been used for prevention of grass-grub infestation the application of 2lb. of 100 per cent. p.p.i. DDT per acre could well be considered if either white butterfly or diamond-backed moth caterpillars are present. Application of DDT-superphosphate as normally used for control of grass-grub (2) would assist growth, control caterpillars, and give future grass-grub control all in one operation. Considering the dual purpose of this treatment, which has been used successfully by several Canterbury farmers, application in calm weather, especially on a dewy morning, is probably best. For this type of treatment the more finely ground forms of DDT have a definite advantage.

The long period between topdressing with DDT-superphosphate and the feeding off of the crop should allow time for the DDT to be washed completely off the crop to the soil. Considerable quantities adhere to the foliage to give control of the caterpillars, and are then washed off by rain to the soil surface for future effectiveness against grass-grub.

It must be emphasised again that DDT will give no control of aphids. Lindane is the material for this purpose. In aphid infestation in crops sown with grass the most economic method of controlling aphids is to use lindane as set out under "Damage to Growing Plants" (b).

Where DDT treatment is desired for grass-grub this is given separately and, if not attended to at sowing down, should be undertaken before the middle of March if damage in new pasture is to be totally avoided.

Damage to Roots by Grass-grubs

Control of grass-grubs damaging roots of turnips and swedes can be obtained by topdressing with DDT-superphosphate as recommended for pastures (2).

PREPARATIONS AND METHODS OF APPLICATION

When treating crops with insecticides by any method farmers or contractors should ensure that there is no risk of killing bees. Beekeepers usually depend for their entire livelihood on their bee colonies and farmers depend on the help of these colonies in the pollination of agricultural crops. It is therefore essential to see that colonies are protected from damage. Under no circumstances should insecticides be applied to flowering crops.

TABLE 2—QUANTITY OF VARIOUS INSECTICIDES TO USE TO OBTAIN EQUIVALENT OF ½LB. OF 100 PER CENT. STRENGTH

Labelled percentage	Quantity to use lb.	oz.
2	25	0
5	10	0
6¼	8	0
10	5	0
16	3	2
20	2	8
20 (liquid)	1 quart	
40	1	4
50	1	0
80	0	10

One of the first decisions in considering various materials is whether to choose a dust or spray to obtain effective control. Dusts have often been considered to have an advantage because they are more readily deposited on the under sides of the foliage. If sprays are fine enough, however, they can with suitable equipment be applied just as effectively. The question is sometimes determined by what equipment is available. Several types are readily available in New Zealand.

Aerial Application

Though the aeroplane has been used extensively in New Zealand, there is every reason to believe that helicopters will become available for this type of work in the near future. The movements of these aircraft can be regulated much more than can those of winged types. Though the latter are able to do an excellent job on flat areas provided the pilot is prepared to fly at not more than 12ft. to 15ft. above the crop, helicopters should soon prove their superiority for undulating paddocks. They are able to fly low over the crop and to hover and turn in very small spaces.

However, conventional aircraft have already made an excellent job of dusting brassicas and other crops in many areas. Little spraying has been undertaken with this type of aircraft, as operators have been anxious to avoid contamination from tanks and booms previously used for weed spraying with hormone preparations. This is important because seedling brassica crops are very susceptible to damage from hormone weedkillers. Spraying is, however, likely to be undertaken by operators as the demand for treatment grows and equipment can be employed exclusively on this work. Techniques are also likely to improve as pilots gain experience in this new field. Growers must realise that some paddocks, with hazards such as trees and power poles, are not suited to aerial work in pest control, where exact coverage is called for.

Preparations to Use

Whether to use a spray or dust will often be determined by the aircraft available.

Dusts: In the past any dusts available for aerial work have been general-purpose dusts which could not confidently be recommended, as the effective dosage has been too costly. Most aircraft are able to deliver as low as 8lb. to 10lb. of dust per acre. Some operators claim accurate spreading with only 5lb. per acre.

As a temporary expedient some firms, with the help of the Entomological Research Station, have developed a method of mixing lime or

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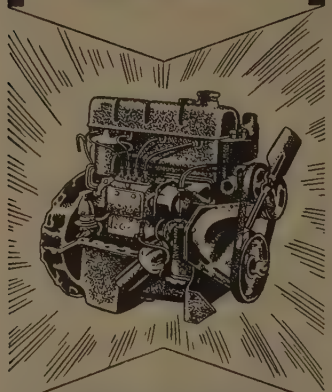

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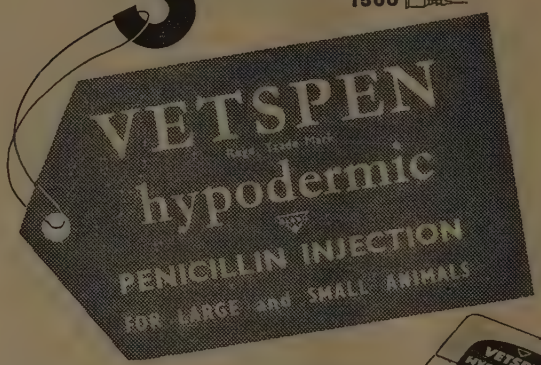

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superphosphate with high-concentration (from 16 to 50 per cent. of active ingredient) lindane or DDT dusts. This gives approximately a 6 per cent. dust for lindane or 12 per cent. dust for DDT. It has been delivered from the aircraft hopper at 8lb. per acre. Particle size in lime and superphosphate is, however, very variable, and tests have shown that there is considerable separation of insecticide from the lime or superphosphate in the air, depending on the height of the aeroplane and respective particle sizes. Though this expedient has often given excellent control in past seasons, the production of dusts of a better type at the correct concentrations to suit New Zealand conditions would be a better arrangement. Firms in this country are now beginning to market such dusts, and these preparations should be available in adequate quantities in the future.

Dosages should be calculated according to the figures given above for active ingredient of insecticide per acre and related to the delivery rate from the aircraft hopper. Operating companies have usually familiarised themselves with these details and can advise growers about their own machines.

Sprays: Owing to the reluctance of operators to use sprays, there has been little opportunity to evaluate this type of application from the air under New Zealand conditions. Overseas experience has shown that all forms of aerial application involve many intricate technical questions. However, there seems little reason to suppose that aircraft could not do excellent spraying provided a few simple precautions are observed, such as flying at the right height and using correct nozzles, pressures, etc.

Because of the weight of water the plane has been required to lift when taking off, often under adverse paddock conditions, the tendency is to use a low gallonage per acre when spraying from aircraft. The most useful preparations of insecticides for this purpose are emulsions. These are available for both lindane and DDT from several firms. The necessary quantity is simply mixed with the amount of water per acre required for a particular plane's delivery rate and the mixture sprayed on the crop. Most aircraft makers can supply tanks, booms, nozzles, and pumps with a prescribed schedule of delivery rates per acre. Emulsions are usually 20 per cent. concentrations. This means they contain approximately 2lb. of active ingredient per gallon. Each quart of such emulsion thus contains ½lb. of active ingredient. Any other concentration of emulsion available is worked out proportionately.

Application by Ground Equipment

Ground equipment for control of pests, either spraying or dusting, falls into two categories: Machines for use by contractors, which because of high capital costs are unlikely to be purchased by farmers, and equipment such as low-volume sprayers, row-crop dusters and sprayers, and fogging machines.

Certain points which apply to all types of ground equipment should be noted. One is that all have the supposed disadvantage of causing damage when driven through the crop. Though this certainly applies to insect control in, say, ripening cereals, trials in brassica crops show that such damage may be regarded as negligible because of the rapid recovery of the plants. In one trial a tractor with 14in. tyres was driven through rape at distances of about 20ft. The crushing of plants appeared at first to be fairly severe, but recovery was rapid and within a short time it was impossible to discern the wheel tracks.

A further point of general application is that ground spraying equipment is of three types—mist sprayers, low-volume sprayers, and medium-to-high volume sprayers. Each depends for its volume of delivery on the relation of its working pressure to the size of its nozzle apertures. This results in differing sizes of droplets being delivered on to the plants. Standard American recommendations issued by the United States Department of Agriculture (1953) (6) for delivery rates are:—

Sprayer	Gallons per acre
Medium-to-high volume	100-150
Low volume	25-50
Mist blowers	5-10

Spray coverage is always greatly enhanced by adding a detergent to the water used. The type of preparation to be used in these various machines is also important. Only machines classed as medium-to-high volume are normally suitable for the use of wettable powders. Even then they should have a considerable return of liquid to the spray tank through a by-pass valve to maintain agitation. Failing this they must be equipped with a mechanically operated mixing device in the tank, as otherwise the powder will block jets and settle out in pipelines and give endless trouble in the field when stoppages are necessary.

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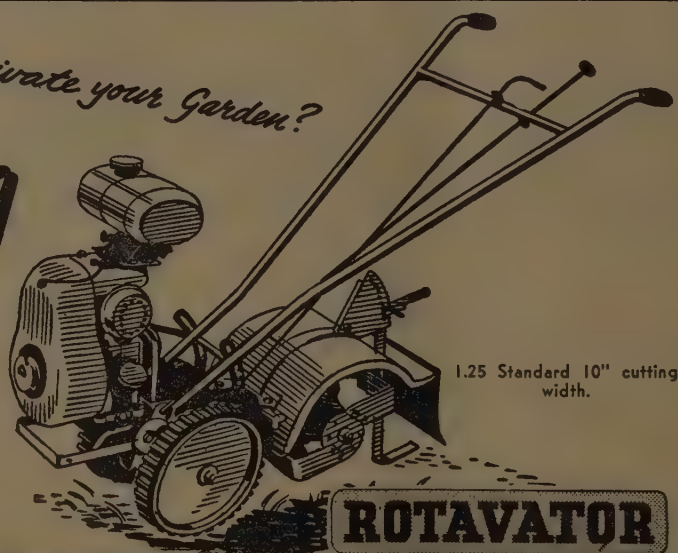

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Most wettable powders are offered at concentrations varying between 16 and 50 per cent. One exception is a finely ground 80 per cent. lindane preparation being sold in New Zealand. As long as the present high quality of this particular product is maintained it can be satisfactorily passed through all sprayers at quantities as low as 10 gallons per acre. Generally, however, the most satisfactory preparations for use in low-volume and mist sprayers are emulsions and colloidal preparations. Lindane is available in a colloidal paste at 40 per cent. concentration, and both lindane and DDT are available as 20 per cent. emulsions.

In all spray operations blockages will be less likely to occur if all insecticide and water are passed through a straining funnel as they are put into the tank or if a permanent strainer is fitted at the tank output. The mesh for such a strainer should have apertures slightly smaller than those of the nozzles used in the boom. This makes it virtually impossible for foreign matter to cause blocked nozzles.

Mist Sprayer-duster

The machine most likely to be of interest to contractors is the mist sprayer-duster. It has been extensively used in trials in Canterbury and elsewhere and has proved satisfactory, either with dusts or sprays. An advantage it has over other machines is that by delivering the insecticide under pressure at right angles to the direction of travel it can cover a swath from 20ft. to 40ft. wide. This means less damage to the crop caused by driving through it. In calm weather, driving round and round the paddock speeds up operation and reduces damage. Care must be taken to obtain overlapping swaths, or bands of untreated plants become evident and act as a reservoir of re-infestation for the treated areas.

This machine can dust or spray and has mechanical agitation in dust hopper and spray tank. It can also deliver water through the spray head at the same time as it delivers dust on to the crop. This results in a damping down of the dust. The machine operates a turbine fan giving a strong draught, which disturbs the foliage and assists in coating the under surface of the leaf with insecticide. It is reputed to be able to drift-dust crops by working from the windward side of the paddock only. However, in trials conducted by the Entomological Research Station it was found more satisfactory to rely on a definite width of swath and accept the small amount of damage caused by driving through the crop.

Materials: Trials conducted with the mist sprayer-duster on a large number of crops showed that with the dosages recommended earlier satisfactory control of brassica pests could be obtained by dusting with 10lb. of 5 per cent. lindane dust or 10lb. of 10 per cent. DDT dust per acre. For sprays, satisfactory coverage and control were obtained by using from 10 gallons of water with the appropriate insecticide per acre. Suitable preparations for spraying are emulsions or colloidal forms or the 80 per cent. wettable powder mentioned earlier.

Low-volume sprayer having a proper row-crop boom with nozzles which spray underneath as well as above leaf surfaces.

Low-volume Sprayers

Many farmers already have low-volume sprayers. These machines are suitable for spraying brassica pests and their use reduces costs. Machines which have been used for weed spraying should be thoroughly washed out with several lots of warm, slightly soapy water. They may then be left running on a supply of clean water. Contamination of plants with the residue of weedkillers remaining in sprayers must be avoided, especially when plants are in the seedling stage. Leather washers, which are a common source of contamination, should be replaced with a set kept solely for crop spraying.

Various sizes of booms are available for low-volume sprayers, the longer ones being a definite advantage in saving time and travelling. Proper row-crop booms, having short auxiliary dropper booms with nozzles pointing upward, are used overseas for this type of spraying. New Zealand firms will produce these to order to suit farmers' requirements. The main problem in control, especially with aphids, is to get insecticide on the under surfaces of the leaves. It is possible to do this among upright plants such as chou moellier or rape by manipulating a horizontal boom at a certain angle. Normally, however, only top application is possible with conventional straight booms.

Row-crop booms, when used in trials comparing them with straight booms, consistently give better overall coverage and consequently better control. This is especially so in districts where crops are habitually planted on ridges. In these areas a boom of this type would definitely pay.

Materials: From many trials conducted with low-volume sprayers it has been found that not less than 10 gallons of water per acre should be applied, even among seedlings. With leafy crops 20 gallons gives reasonable coverage, and more may be used to advantage. The low-volume machine is suitable only for emulsions and colloidal forms of insecticides. Trouble may be expected if wettable powders are tried.

The aim is to get as much leaf coverage as possible with the quantity of water available at the nozzles. This will vary with the stage of the plants, and generally greater bulks of leafage require correspondingly greater quantities of water. Some economy in water usage can be gained by aiming to produce finer spray droplets. This depends on pressure and nozzle aperture size. Ample information is available on these points

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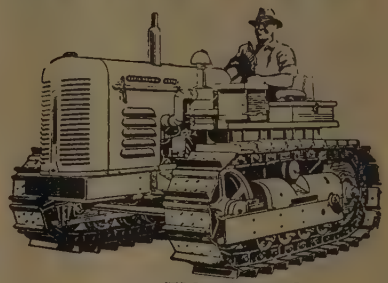

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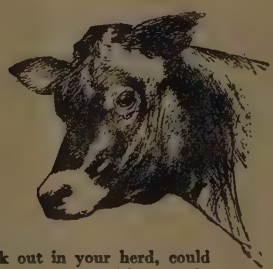

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from suppliers' charts which are familiar to those using this apparatus for weed spraying. Dosages are again ½lb. of 100 per cent. lindane or 1lb. of p.p.i. DDT as indicated earlier for the different pests.

Medium-to-high Volume Sprayers

Some farmers have medium-to-high volume sprayers of various types, mostly home constructed. Dosages of insecticides (active ingredients) are the same as for other types of spray outfits, but as most of these machines deliver a fairly coarse droplet, quantities of water may vary over a wide range. Trials may be conducted with water to see what gallonage per acre gives good leaf coverage, and the spray can be made up on this basis.

Dusters

Row-crop dusters are available to farmers in some areas. Considerable data should be available where these machines have been used on other crops, such as potatoes, to indicate what quantity of dust they distribute per acre. It is then necessary to work out what concentration of insecticide is required for brassicas to give the desired active ingredient per acre.

Help of commercial firms should be sought to discover if the necessary dusts are readily available. Dusters are not suitable for dusts which employ lime or superphosphate as a filler. Where no suitable dust is available the Entomological Research Station may be able to assist with advice.

Fogging Machines

Fogging machines are new in crop protection in New Zealand. Overseas wide benefits have been obtained from the use of such equipment, which relies on draught driving the insecticide over a heated plate, thus producing a fog which is drifted on to the crop. The fog is an assemblage of extremely fine spray droplets and gives excellent foliage coverage. Suppliers will usually be keen to offer advice based on the dosages given in this article.

As the machine is a specialised piece of equipment which is a complete departure from the older types of machinery for the application of insecticides, the suppliers' recommendations on materials should be observed strictly.

COSTS

The price of lindane will vary with the type of preparation used, but the equivalent of ½lb. of 100 per cent. material will cost from 15s. to 25s. DDT is normally available in forms suitable for both dusting and spraying at 1lb. p.p.i. per acre for from 10s. to 12s.

In aerial applications cost of flying time must be added to these charges. This varies from 7s. per acre for dusting to as high as £2 per acre for spraying. Normally, spraying is the costlier procedure owing to the necessity to carry clean water to the aircraft and to employ expensive, high-grade pumps and booms.

MISCELLANEOUS

Residues

Crops which have been treated should not be fed to stock intended for slaughter until after a good rain has fallen or considerable time has passed to allow the development of a bulk of new, untreated foliage. Under favourable growing conditions this would occur in 14 to 21 days in most districts. This precaution applies particularly to the use of rape for feeding lambs. No harm befalls the stock itself, but health authorities throughout the world place strict limits on the amount of insecticide which meat for human consumption may contain.

Retreatment

In considering the economics of pest control the question is bound to be asked as to how long protection from one treatment will last. No clear answer to this question can be given. It depends partly on climate and consequent plant vigour and partly on the presence or absence of insect diseases and enemies. The treatments outlined in this article have been designed to give as much protection as possible for a given unit of cost.

It is almost impossible for a plant to recover from severe insect damage. This is particularly true where aphids are offenders. Hence treatment should be undertaken early with a threatening infestation.

Under the worst possible field conditions the treatments outlined are likely to give protection for 3 to 6 weeks. If a major re-infestation occurs, the low cost of an application would justify retreatment. The economics of this procedure must be balanced against the amount of feed available and the likely cost of buying in hay or grazing because of failure of brassica crops due to insect attack.

General Observations

There are one or two observations which may assist growers in their consideration of the economics of pest control.

Up to the present many crucifer crops have always been drilled in 7in. rows, especially in low-rainfall areas. It has been generally accepted

that this gives greater bulk of feed per acre than sowing in ridges. Growers who have continual difficulty with pest control in drilled sowings may find it economical to sow crops in more widely separated rows or on ridges to facilitate proper pest control at a later stage of the crop. Trials show that in all forms of boom spraying there is a limit to the coverage possible on drilled crops as normally seen in this country, though overseas row-crop booms have proved superior for many forms of pest control.

A further practice from which growers may profit is that of leaving a small portion of the paddock untreated. In all properly laid out trials these untreated areas (known as controls) are used. They give a continuous comparison of the effectiveness of any method of treatment. Where the whole paddock is treated and the offending insect disappears this may be due to the insecticide and method of application, but could in brassica pests be due to natural conditions which have adversely affected the insect.

If an untreated strip is left, comparison of it with the treated area will show exactly the extent to which the insecticide gave control. If control is unsatisfactory, it will be wise to try some other method. When a successful treatment for a particular area has been evolved, the control strip may be omitted. So many methods are available for such a wide variety of brassica crops in varying climatic and topographical conditions that local trial and error frequently will give very sound guidance for future seasons.

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Photographs by Department of Scientific and Industrial Research and Cawthron Institute.

Use of Immune Serum will Prevent

Calf Losses from Redwater in Unvaccinated Herds

By J. M. RUDGE,
Bacteriologist, Department of Agriculture Animal Research Station, Wallaceville

A VALUABLE method of controlling the spread of redwater and of preventing calf losses in unvaccinated herds has resulted from recent research at the Department of Agriculture's Wallaceville Animal Research Station. The method is to inject an immune serum which it is hoped will be in commercial production and available to farmers this season.

LEPTOSPIROSIS (infectious "redwater") is an economically important bacterial disease occurring in cattle, sheep, pigs, and man.

It may cause serious losses in dairying areas through abortion, death of young calves, and lowered production. Symptoms frequently go unnoticed in mature animals, but calves may develop severe jaundice and blood-discoloured urine which gives the disease the name of "redwater".

Animals which overcome the disease and make an apparent recovery may harbour living organisms in the urine and become a dangerous source of infection to other animals on the farm. These disease-spreading "carriers" can be detected only with specialised laboratory techniques.

Two Methods of Control

Two methods are available for controlling the spread of infection: the use of antibiotic drugs and vaccination.

Antibiotics may be used to combat the disease once an animal has become infected. They may help to reduce the number of deaths and prevent the more severe symptoms appearing, provided that the drug is administered in the early stages. However, antibiotics may fail to prevent the appearance of infective organisms in the urine and they have the added disadvantage that their activity in the body is short-lived and therefore of little use in protecting healthy stock in contact with diseased animals.

The purpose of vaccination on the other hand is to confer immunity and prevent the disease becoming established. Vaccination of the entire herd is considered the most effective control measure.

Last year at the Wallaceville Animal Research Station it was shown that young calves can be completely protected by vaccinating the cow during pregnancy. Protective antibodies are produced in response to vaccination and are passed to the calf in the colostrum (first milk).

A similar transfer of protective antibodies from the cow can be achieved by injecting the calf with the cow's blood serum.

Vaccination of selected cows with the object of protecting their calves may not be regarded as economically worth while by some farmers, since only heifer calves would be retained.

Trial with Four Groups of Calves

The alternative method of injecting serum to prevent the spread of infection in a mob of calves, and at the same time to treat those already infected, has been investigated in a recent trial at Wallaceville.

Twenty-three calves were injected with infective material and divided into four groups as shown in the table below. Blood serum from a vaccinated calf was injected into two of the groups to test the ability of the protective antibodies to combat infection. Calves in group 1 received serum 7 days before attempted infection and in group 2 4 days after the onset of the disease.

In group 3 streptomycin, an antibiotic which had proved no less effective than several others tested at Wallaceville, was administered on the 4th, 5th, and 6th days of the disease. Calves in group 4 were not treated. The results of the experiment are shown below:—

Group	No. of calves in group	No. of carriers
1. Serum 7 days before attempted infection ..	6	0
2. Serum on 4th day of infection	6	1
3. Streptomycin on 4th, 5th, 6th days of infection ..	5	5
4. Untreated controls ..	6	6

In this preliminary trial calves receiving immune serum before exposure to infection were completely protected, and the number which became carriers was effectively reduced among the calves treated after the onset of the infection.

These results show that use of immune serum will provide a valuable method of controlling the spread of leptospirosis and of preventing calf losses in unvaccinated herds. All calves on the property should be treated as soon as the first case of leptospirosis is recognised.

It is hoped that serum will be available commercially for use this season.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during August 1956 with comparative figures for the same month of 1955 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Month	Creamery (tons)	Whey (tons)	Total (tons)	Percentage inc. or dec.
August 1956	10,549	113	10,662	—
August 1955	9,913	103	10,016	—
Increase or decrease	+636	+10	+646	+6.449

Butter in store at 31 August 1956 was 13,102 tons

CHEESE

Month	White (tons)	Coloured (tons)	Total (tons)	Percentage inc. or dec.
August 1956	1,746	—	1,746	—
August 1955	1,375	—	1,375	—
Increase or decrease	+371	—	+371	+26.982

Cheese in store at 31 August 1956 was 11,702 tons

If these figures are converted into butterfat equivalent, there is an increase of 7.645 per cent. in butterfat graded for August as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

Importance of Soil Acidity in Maintenance of Fine Turf

IN the maintenance of good, fine turf for sports areas soil conditions must be created that encourage the fine turf mat to the almost total exclusion of undesirable plants such as clovers, coarse grasses, and flat weeds. That this can be done has been well demonstrated on research areas and subsequently on some of the better sports grounds. One of the important factors is keeping soil acidity to a desirable level, and in this article C. During, Research Officer, Department of Agriculture, Wellington, deals with this aspect of greenkeeping.

THOUGH the art of keeping fine turfs is an old one, the fact that soil acidity is of importance in their maintenance was discovered only quite recently. After the First World War the United States Department of Agriculture co-operated with the United States Golf Association in field research with regard to fine sports turf. The results from these experiments were published in 1925. The main findings were that weed-free plots of browntop treated monthly with sulphate of ammonia or ammoniated superphosphate were less subject to weed invasion and freer from worm casts than similar plots topdressed with nitrate of soda or lime. The beneficial effect of sulphate of ammonia was attributed largely to its effect of increasing the acidity of the soil.

At this stage it may be worth while to explain the term pH, a term which is used to describe how acid or alkaline a soil is. The following table refers to mineral soils only.

pH	
8.0	Alkaline soil. This is not very common in New Zealand.
7.0	Neutral soil. This is more common in New Zealand. Often this "high" pH value is the result of very heavy liming.
6.0-6.5	Slightly acid soil reaction. On most farmed soils this is the minimum pH compatible with vigorous pasture growth.
5.5	Moderately acid soil. This pH is a little low for vigorous growth of pastures and crops on many, but by no means on all, soils.
5.0	Acid. On very few mineral soils is a soil reaction of this degree of acidity compatible with vigorous pasture growth.
4.5	Very acid. Soils with this pH are too acid for vigorous growth of clovers and high-producing grasses.
4.0	Extremely acid. Such soils will not support vigorous growth of any useful grass or clover.

Most vigorous ryegrass-white clover pastures, then, grow on soils with pH values of 5.5 to 8.0. More acid soils can often grow good browntop, chewings fescue, and a few clover species of low productivity, but seldom the high-producing white clover.

Browntop and chewings fescue will also grow well at pH 5.5 and higher, but the competition from clovers and the coarser grasses is more intense at these levels. Even the most extravagant use of selective hormone weedkillers may not be able to save the finer grasses from taking a minor position in the turf. The aim of every greenkeeper, therefore, should be to keep the soil acidity moderate enough to have the finer grasses growing vigorously and yet sufficiently acid to make conditions less attractive for clovers and some of the coarser grasses and weeds.

Before definite recommendations are made on how to achieve and maintain correct acidity it is worth while saying a little about the consequences of correct acidity and over-acidity and its relation to sulphate of ammonia and other nitrogenous fertilisers. Knowledge of these factors is derived mainly from experiments on sports turf carried out at Palmerston North under the guidance of Sir

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Bruce Levy and in co-operation with the Manawatu Golf Club. In recent years Sir Bruce Levy has also used bowling and croquet greens at Palmerston North to find the solution to over-acidity. From this work the following points have emerged.

Correct Acidity

The degree of soil acidity desirable for the maintenance of a fine turf on playing greens lies probably between pH 4.5 and pH 5.3, depending on soil type. This will be discussed later in more detail. This correct soil acidity, induced by the use of the 3 : 1 mixture of sulphate of ammonia and superphosphate, has several desirable effects on fine playing turf. It provides unsuitable conditions for the casting type of earthworm, it discourages the growth of clovers, especially white clover, and it discourages many flat weeds.

Induced soil acidity slows down or altogether inhibits the activity of many soil bacteria. Some soil bacteria, for instance, digest the dead plant roots and other fibre of plant origin and convert it into humus.

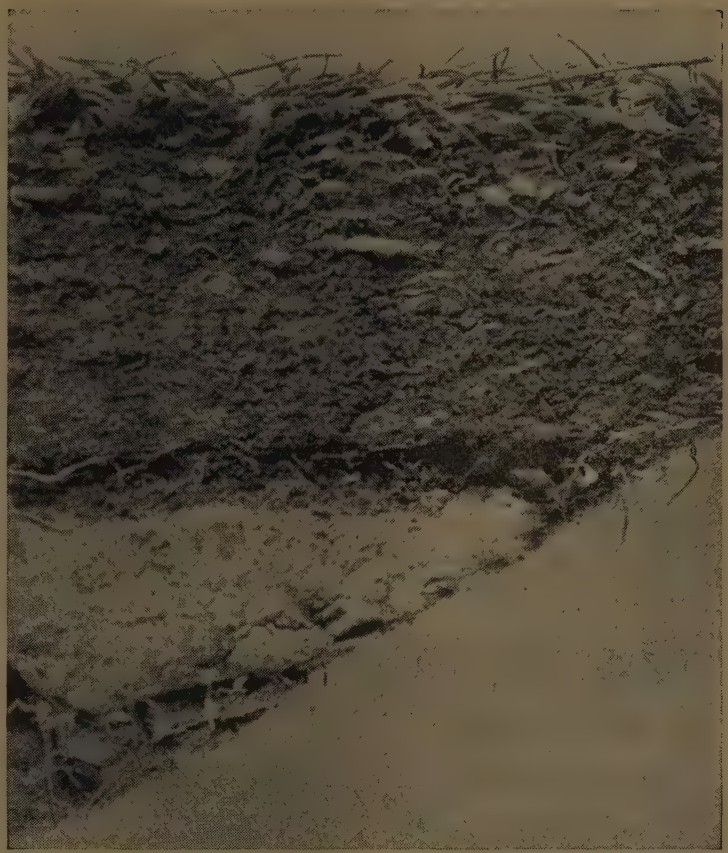
On an acid site (usually pH 4.5 to pH 5.2), therefore, owing to restricted activity of many soil bacteria, undigested fibre accumulates just below the crowns of the grasses to form in time a fibrous mat ½in. to several inches thick. A mat of moderate thickness, about 1in. thick, is desirable on golf greens, because it gives turf with resilience and good wearing qualities. Acidity alone, however, will not usually produce a good turf mat in a short time. Adequate amounts of superphosphate are needed as well as sulphate of ammonia.

Acidity within the range of pH 4.5 to pH 5.3 by inhibiting the bacteria responsible for the formation and turnover of soil humus makes the structure of the soil more subject to deterioration. For instance, it facilitates the compaction of the soil below playing turfs. Provided the soil in question is not too heavy and of a naturally good structure, a certain amount of compaction, however, is an advantage on bowling greens and tennis courts.

Acidity within the range indicated above also reduces the rate of growth of the fine grasses. This reduction in the rate of growth is thought to increase the fibre content of the herbage, thereby making the sward hard wearing. Naturally any such improvement in the wearing capacity of the sward is a decided advantage.

Over-acidity

The continuous use of the 3 : 1 mixture of sulphate of ammonia and superphosphate sooner or later, depending on the type of soil, leads to over-acidification of the soil. This will have the following unfavourable consequences.



Fibre mat on over-acid golf green. It shows a sudden change from undecayed fibre to compact, light-coloured soil. (The sample was cut out diagonally so that it could be removed easily and the smallest possible area of the green was disturbed.)

On golf greens the turf mat of moderate thickness will become thicker, coarser, and may develop "waxiness". Like many peats it will become difficult to wet. The underlying soil will be over-compact and a definite break between the peaty organic layer and the soil will develop. Even in bowling greens a fibrous layer is likely to develop despite regular topdressing with soil and coring. This will make the green too slow for high-class play. However, this can be overcome by annual grooving and topdressing with soil. Excess acidity (pH 4.5 and below) by various means, which cannot be dealt with here, causes further deterioration of soil structure and hence leads to excessive soil compaction, which is aggravated by rolling and the normal traffic on playing greens.

Excessive compaction of the soil leads to poor water penetration and poor aeration. Both air and water are essential for the growth of all plants. Regular and intensive grooving and particularly deep coring as well as topdressing with new soils do much to counteract the natural deterioration of structure under a highly acid soil. The beneficial effects of dense deep coring also show clearly that the dangers of high acidity lie not only in their influence on plant nutrition, but in the damaging effect on soil structure. This may explain why one bowling green on the coast near Wellington situated on a well-aerated, sandy loam did not show symptoms of over-acidity despite an extremely acid soil reaction (pH 4.1 to pH 4.3).

How to Achieve Correct Acidity

Heavy dressings of sulphate of ammonia will increase soil acidity fairly quickly. On all but few soils there is little need to accelerate the formation of soil acidity by any other means. Sulphate of iron, however, could well be added to the fertilisers where bowling greens or tennis courts are laid down on fertile alluvial soils

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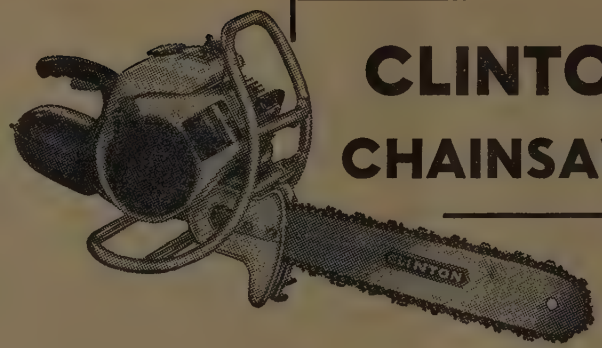

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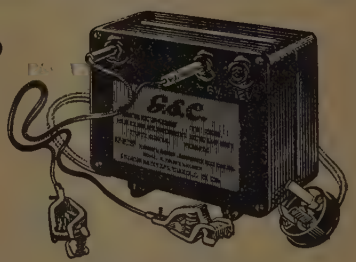

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or on soils naturally rich in lime. This was shown on the fertile alluvial soil of Palmerston North, where in several trials the addition of sulphate of iron at 1cwt. per acre per annum (1/3rd oz. per sq. yd.) proved advantageous in the early years.

Once the soil becomes more acid (pH 5.5 or below), however, sulphate of iron may be harmful and its use should be discontinued.

Special problems are created by alkaline or nearly alkaline soils. These occur near Gisborne, in Hawke's Bay, and in the drier districts of the South Island, particularly in Central and North Otago. Here acidity can be increased by the use of elemental sulphur; 1cwt. of sulphur neutralises about 3cwt. of high-grade limestone. Just as worthwhile reduction of acidity is usually obtained only by an application of 1 ton or more of limestone per acre, so are high rates of sulphur needed to increase acidity markedly. Up to 6cwt. of elemental sulphur per acre (2oz. per square yard) has been used at Palmerston North in one dressing without doing any damage to the turf.

The chalk used in marking lines on tennis courts causes a decrease in acidity which is accompanied by an unsightly increase of white clover along the lines. This, too, can be counteracted by the use of sulphur. Several proprietary marking compounds are now available which do not affect the pH of the soil.

How to Reduce Over-acidity

In New Zealand many bowling and golf greens have now been fertilised for 10 to 17 years with the standard mixture of 3 parts of sulphate of ammonia to 1 part of superphosphate. The effects of this treatment are now showing. The soil has become highly acid, the grasses unthrifty, and the ground is very compacted; it is difficult to wet, so that little benefit is obtained from quite heavy falls of rain.

On golf greens the turf mat becomes excessively thick and its consistency harsh, with some waxiness developing, which stops water from penetrating. Bare patches developing on this type of peat pasture are almost impossible to reseed without tearing up the peat mat very thoroughly and topdressing with copious amounts of soil.

The answer to these problems in bowling greens, tennis courts, croquet greens, and any other turf which does not need a turf mat has been found by Sir Bruce Levy at Palmerston North. It consists of applying a heavy dressing of finely ground limestone, usually at 1 to 2 tons per acre (7oz. to 11oz. per square yard), after which treatment with the 3 : 1 mixture of sulphate of ammonia and superphosphate is continued. A dressing with lime is repeated only after several years, when the turf will again be showing signs of too-high soil acidity.

Lime should certainly not be applied frequently in small amounts, as such a practice favours the ingress of weeds and clovers. Where necessary, ground limestone should be screened to remove coarse particles before it is applied to playing greens.

Desirable Levels of pH

The desirable level of pH will vary with soil type and with the purpose of the green.

Golf Greens

Of 13 golf greens examined in the Hutt Valley those with pH 4.6 and higher seemed still to support a good, vigorous sward. The fibrous mat was well developed and almost ideal.

Higher acidity than that represented by pH 4.5 led to a very coarse, waxy type of fibrous peat, severe compaction of the soil below the peat, very poor penetration of water, and dying out of sward in patches. These dead patches are not easily mended by oversowing. There is, so far, no known safe treatment which will give rapid improvement to a golf green which has deteriorated through over-acidity, at least no measure other than mechanical removal of the top-soil, the spreading of brought-in soil, and resowing. Heavy liming is too slow acting for practical purposes; moreover, unless earthworms are present it is doubtful whether liming will lead to a digestion of the fibrous peat within reasonable time. Earthworms, however, have no place on a putting green.

Hence the way to maintain a perfect green lies in the prevention of over-acidity, not in the correction of over-acidity.

As soon as a putting green has reached the ideal balance between a springy, fibrous mat and reasonable vigour of sward lime should be applied at a rate which will counteract the acidifying effect of the sulphate of ammonia which will be applied in the coming 3 years. Usually about 8oz. to 10oz. of finely ground limestone per square yard will be required every 3 years.

Once a putting green has deteriorated badly it is too late to expect satisfactory results from liming.

Bowling Greens and Tennis Courts

As a mat of turf is not desirable for bowling greens and many effective chemicals are available for controlling weeds and earthworms, there is no doubt that acidity can be reduced on many greens.

Sir Bruce Levy estimates that at Palmerston North on the fertile alluvial soils pH 5.0 represents about the ideal degree of soil acidity. An extremely thrifty turf at Eastbourne (on the eastern side of Wellington Harbour) has been found to have a soil reaction of pH 4.1 to 4.3 in the top 2in. Here there was no reason to advocate the use of lime yet. On the other hand several bowling greens examined in Wellington itself having a soil reaction from pH 4.2 to 4.5 lacked vigour. The greens appeared to need lime. On the fairly light soils of Wellington 1 ton of lime would be expected to be effective. The ideal pH range for greens in Wellington itself would probably be the same as that advocated at Palmerston North.

In districts of the South Island where the soils used on bowling greens may be markedly deficient in available molybdenum a much higher pH on bowling greens may be both safe and desirable.

Summary

1. Soil acidity can be considered only in association with the nitrogenous fertiliser used.
2. In New Zealand sulphate of ammonia has proved the most satisfactory nitrogenous fertiliser for fine turf.
3. The prolonged use of sulphate of ammonia, however, leads to over-acidification. Symptoms of over-acidification are: Harsh, thick, fibrous mat in golf greens that is difficult to wet, poor soil structure, poor aeration and water absorption of soil, unthrifty turf, and an increase in fungous diseases.
4. The ideal degree of acidity is one which will allow vigorous growth of fine grasses without allowing clovers, coarser grasses, and certain weeds to become too competitive. The development of selective weedkillers may do much in allowing a freer use of lime to reduce acidity and improve vigour.
5. Lime should be used seldom and at a heavy rate.
6. The ideal pH depends on the purpose of the turf and the soil type. Though little precise information is available, it is suggested that golf greens may be kept at a pH slightly lower than that desirable for bowling greens and tennis courts.

Reference

A. J. Metson and H. S. Gibbs, "Effect of Manurial Treatments on Soil Properties at the Hokowhitu Experimental Plots and Some Practical Applications," New Zealand Journal of Science and Technology, vol. 27A, No. 5 (1946).

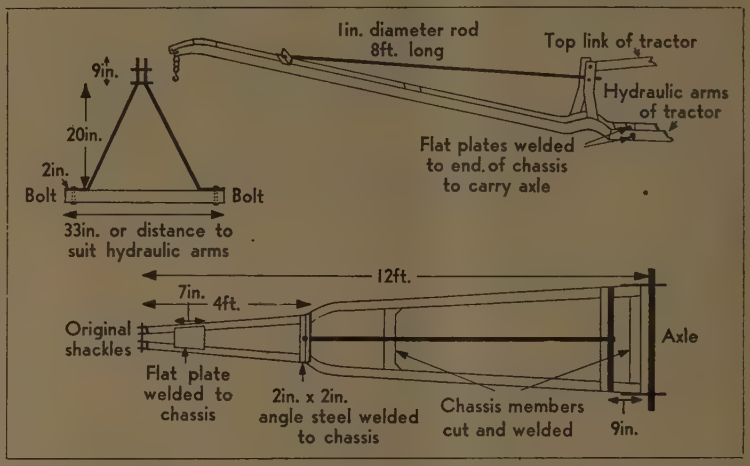
Hydraulically Operated Tractor Jib

WITH the increasing popularity of hydraulically operated tractor implements in New Zealand tractors are being used for many other labour-saving jobs on the farm. In this article W. A. McKellar, Fields Instructor, Department of Agriculture, Timaru, describes a cheap and efficient jib constructed by an Ashburton farmer from an old car chassis and fitted to the hydraulic arms of his tractor.

ON all farms, and particularly on one-man farms, there are many occasions when heavy objects have to be lifted. The proportion of strained backs and muscles and other injuries associated with heavy lifts is probably very high among those engaged in farming. In addition injuries to fingers and toes occur in the manhandling of heavy objects. How often on a farm does one man or more attempt to lift weights which are beyond his or their strength?

A few years ago an Ashburton farmer on a one-man farm decided to make a jib to fit on the hydraulic arms of his tractor. He used hardwood to obtain strength in the jib, but found the extra weight of the hardwood reduced the lifting power of his tractor. He then substituted an old car chassis for the timber, thereby reducing the weight but retaining the strength of the jib. By doing all his own cutting and welding the farmer was able to convert the chassis quite cheaply.

The diagrams and photographs illustrate the method of construction and some of the uses to which the jib can be put. First, the chassis cross-members were cut and welded to bring the chassis into a V-shape with the original front shackles left a few inches apart. The width at the other end of the chassis was made to suit the distance between the hydraulic arms—on this particular tractor it was 33in. A piece of flat steel 7in. long was welded on to the chassis members close to the shackles to keep the tip of the jib rigid.



Four feet from the shackles a piece of 2in. x 2in. angle steel was welded across the chassis to carry an 8ft. x 1in. diameter round rod. Two lengths of flat steel 2in. x ¼in. x 30in. were bent to form a triangle and bolted on to the chassis about 9in. from the lower end of the jib. The 8ft. rod was attached near the top of the triangle and the top hydraulic link was attached above the rod. The increased purchase obtained by this method was much more satisfactory than a direct connection from the top link to the tip of the jib by a chain. Two flat plates 10in. x 2½in. were welded on to the rear ends of the main chassis members to carry a 1in. diameter axle through the chassis and lower hydraulic arms of the tractor. To complete the jib a bolt was placed through the shackles at the tip to carry a short chain and hook.

Car chassis vary in shape and size and a farmer attempting to make a similar jib would need to check the measurements with those shown in the accompanying diagrams.

With the jib attached to the hydraulic system of this farmer's tractor objects can be lifted up to 11ft. from ground level. The heaviest lift on the same tractor was a 7cwt. grader blade. Where a greater purchase is required when such objects as a strainer post or a small tree stump are being pulled out a chain is attached to the chassis cross-member half-way down the jib instead of making the lift from the tip of the jib. The hydraulic pumps on most tractors can lift considerable weight, but where heavy objects are to be lifted a strong pump is essential. In addition, front-wheel weights or a front-end weight should be attached to the tractor to prevent the front of the tractor from rearing up when heavy objects are being lifted.

Left—Concrete mixer being loaded on to truck. Right—Jib raised to maximum height, about 11ft.

Compiling Mashes for Layers in Battery Cages

By J. EDMONDSON,
Poultry Experimentalist,
Department of Agriculture's
Poultry Demonstration Plant, Upper Hutt

INTEREST is increasing in battery laying cages as a means of achieving greater efficiency in commercial egg production. The feeding of laying stock in hen batteries is the subject of this article, particular attention being given to the rations most suited to birds in this environment.

WHEN birds are kept intensively in cages or on the floor they depend entirely on the food supplied to them. They have no opportunity to supplement their diet by foraging as birds on range are able to do; consequently a ration for intensively kept birds must supply all the nutrients for maximum egg production and health. A balanced ration of cereals and cereal by-products, protein-rich foods, minerals, and vitamins is essential. A deficiency of any one of the food nutrients required by a layer can have serious repercussions on egg production or health.

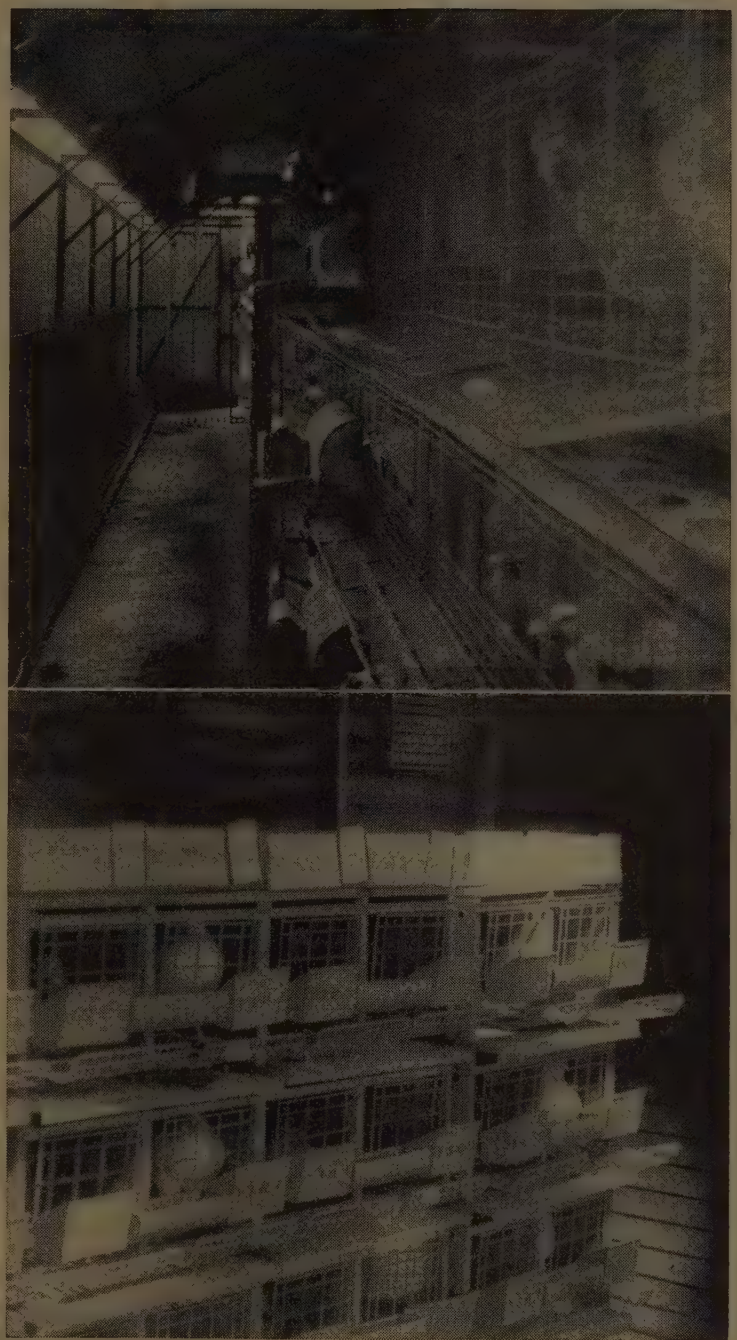
A marginal deficiency can often be more serious than an acute deficiency, as the chronic condition likely to arise is not so easily recognised as symptoms resulting from a gross deficiency and therefore is not readily corrected.

Though no claims to finality can be made, sufficient knowledge is available on poultry nutrition to enable suitable rations to be compounded for birds under the widely different conditions applicable today, including poultry kept totally confined without access to direct sunlight and range, as in battery laying houses.

When the value of a ration is being judged it is necessary to consider not only nutritional requirements but also palatability, the physiological effects, and cost. It is well known that a fine, dusty mash is unappetising, causing a low food intake; also that wheat, for example, if very finely ground, can cause digestive disturbances. The best ration, all things taken into account, is one giving the best economic return.

There are two extremes: a ration which though resulting in good egg production costs more to make up than it is worth; and probably the most common, the low-priced mash of cheap, second-quality ingredients and so poor nutritionally that production is limited, rendering it as expensive as, if not more so than, the higher-priced ration.

Feeding a layer is about 60 per cent. of the total cost of egg production; consequently poultry keepers do not consider the price of mash per ton but the cost in food to produce a given



Upper—Cafeteria feeding system in which the food hoppers are propelled slowly by mechanical means along the rows of cages. Lower—Cages with fixed feeding equipment.

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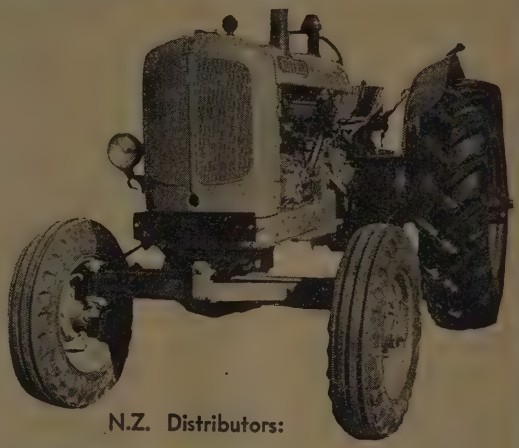

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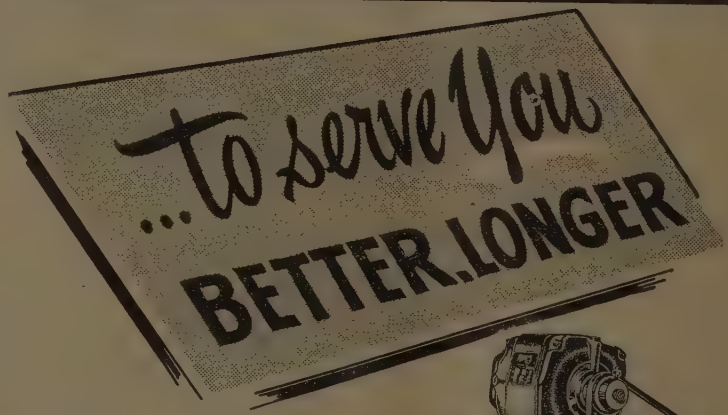

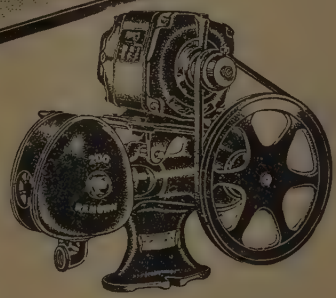

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number of eggs. Food costs in relation to egg production can best be emphasised by an example. If 240 layers eat approximately 5oz. of food a day, they would consume 1 ton in a month. If by improvement of the quality of mash each bird laid only 2 eggs more, that is 40 dozen eggs more from 240 layers in a month, additional income at 4s. per dozen would be £8, minus the extra cost per ton of the improved ration.

When mash is compounded to a formula the quality of ingredients is very important. Inferior ingredients may render a mash totally unsuitable, even though it is made up to a recommended formula based on knowledge of food requirements and substantiated by feeding trials. It is important, too, that all ingredients are mixed evenly through the mash, and that the mixed food should be stored in a reasonably airy, cool, and shaded place. Exposure to light and heat can substantially lower the nutritive value.

The usual practice is to feed an all-mash or pellet ration in the battery house. Provided the food is balanced, either mash or pellets are equally satisfactory. Much depends on circumstances and individual preference of the poultry keeper. Some claim that pellets reduce wastage, but this is a matter of food trough design or possibly a tendency to fill the troughs more than half-full.

Cereals

Between 80 and 90 per cent. of a ration consists of cereal grains and their by-products. This part of the ration, rich in carbohydrates, is the main source of energy. The foods in this category may be divided roughly into three groups. Foodstuffs such as wheat and maize are termed high energy foods, barley and heavy oats of medium energy, and light oats, bran, and pollard of low energy. The quality of pollard today is of lower calorific value compared with the pre-war product as a result of the higher flour extraction rate introduced in wartime.

The recent rise in price of wheat offals has brought them more into line with other food ingredients, and the difference in price between a mash containing approximately 50 per cent. and one containing less has been reduced; consequently there is not the same temptation to economise in food costs at the expense of food or energy value.

Poultry keepers and manufacturers would be well advised to consider the advantage of producing mashes of a higher energy content; that is, more meals ground from good-quality grain and utilising pollard and bran more to improve the physical properties of a mash by improving the texture and consequently palatability rather than including it as a main food ingredient. This would result in the production of mashes nearer in type to the high efficiency mashes used overseas.

Comments on the more common cereal ingredients of rations are as follows:—

Ground Wheat

Coarse ground wheat may constitute up to 50 per cent. of an all-mash diet. Coarse grinding is essential, making the mixture more palatable. If reduced to a fine meal, it may cause digestive trouble.

Ground Maize

The amount of ground maize used is limited by the price. A minimum of 10 to 15 per cent. is recommended.

Ground Barley

Tests of ground barley with laying stock show that it may be included at 30 to 40 per cent.

Ground Oats

Some samples of ground oats purchased are prepared from inferior grain. Only good-quality, heavy oats should be used. Ground oats in a mash helps to prevent cannibalism.

Bran

Bran is low in digestive nutrients and should be included in the ration in limited amounts. Bran is mainly valuable in opening up a mash and by reason of its bulk helping to improve texture and palatability. It supplies some of the B complex vitamins and is a good source of manganese.

MASHES FOR LAYERS IN BATTERY CAGES

Upper and lower—Types of small laying batteries suitable for housing a few birds.

Pollard

Pollard is similar in many respects to bran, but has a higher nutritive value.

Proteins

Laying birds require about 15 to 16 per cent. of protein. Of this, the cereal in the ration will contribute about 11 to 12 per cent., depending on the type, proportion, and quality used. Protein-rich foods are used to supplement the ration to the required level. In many countries protein-rich foods of animal origin, such as fish meal, meat meal, milk powders, etc., are in short supply and are very expensive. This means that protein foods of vegetable origin that are of poorer biological value are widely used. In New Zealand, however, poultry keepers are fortunate in having an adequate supply of meat meal and milk powders (buttermilk powder and skimmed milk powder) at a comparatively reasonable price.

Meat meal is considered to be one of the best-balanced protein-rich foods. It also contains minerals, fats, and vitamins of the B complex. Good-quality meat meal only should be used. Milk powders are becoming more popular for use in layers' rations, even though the price is higher than that of meat meal.

Milk powders are the best all-round protein-rich foods available. In addition to proteins of a superior biological value they contain other essential food factors not present in meat meal, including some of the B complex vitamins.

Buttermilk and skimmed milk are rich sources of riboflavin (vitamin B_2) and these products could be used to increase the feed value of a ration by replacing part of the meat meal. The additional cost would be offset by an increased efficiency of food utilisation. A number of poultry keepers are already doing this and are more than satisfied with the results.

Minerals

Many minerals listed as essential are fortunately present in ample quantities in any normal poultry ration. In practice, the poultry keeper need concern himself only with calcium, sodium, chlorine, and possibly phosphorus and manganese, and these are readily available.

Sodium and chlorine requirements can be met by adding common salt at ½ per cent. or ½lb. to each 100lb. of mash, where birds are on an all-mash diet.

Marginal manganese deficiency may sometimes occur where high energy rations are fed; that is, where little or no bran and pollard are used in a mash. This can be guarded against by the inclusion of 4oz. of manganese sulphate to each ton of mash. The difficulty of mixing such a small quantity efficiently can be overcome by mixing the manganese sulphate in with the salt; 4oz. to 10lb. of salt would give the correct ratio.

In batteries the additional calcium required can be fed as oyster-shell grit or limestone grit scattered over the mash or pellets from time to time. Provided some remains in the troughs, the birds will eat all they require. Some poultry keepers prefer to use oyster-shell dust or limestone flour mixed in the mash. In this case it should be included in the mash at the rate of 5 per cent. by weight.

Phosphorus requirements of a laying bird are normally adequate in the usual type of ration, and additions are rarely necessary where a fair percentage of bran and pollard is used. In high efficiency mashes which are increasing in popularity and which contain only a small percentage of wheat offals the possibility exists of a deficiency arising. To ensure against this the addition of 1 per cent. by weight of steamed bone flour would be wise. In a battery mash containing added oyster-shell dust or limestone flour at a 5 per cent. level, 1 per cent. of this would be replaced by 1 per cent. of steamed bone flour.

Vitamins

Two very important vitamins in poultry nutrition are vitamins A and D_3, without which it would be impossible to house birds intensively.

A variety of products rich in vitamins A and D_3 are on the market ready mixed. The maker's instructions should be read carefully to ensure that the right amount is used and that by correct mixing the vitamins are evenly distributed through the mash. Fish oils and emulsions were once used exclusively, but recently the use of stabilised and synthetic vitamins has become popular. The latter products have a decided advantage in that the vitamin A content is stable, whereas oils sometimes show alarming loss of vitamin A potency when mixed in the mash, necessitating the mixing of mashes at frequent intervals to ensure a good dietary level when fed to the birds.

The riboflavin (vitamin B_2) requirement for egg production is appreciably lower than that required for chickens and for hatchability in breeding birds. Sufficient of this vitamin is present in rations for birds in laying batteries, particularly where milk powders and dried lucerne meal are used. Among some poultry keepers there is a misconception that riboflavin is a substitute for milk powders. This is not correct, for though milk powders are a good source of riboflavin, which can be replaced by the pure riboflavin, they also contain other important vitamins, as well as being a first-class protein food.

The following examples are of all-mash rations suitable for feeding to birds kept intensively either in laying cages or ordinarily housed. The full calcium requirement is included in the ration as ground oyster-shell or limestone. If preferred, the calcium could be supplied by feeding all or part of the limestone or oyster-shell as grit in the food troughs. In this case the amount added to the mash would be reduced accordingly.

Example 1 is a more formal type of layers' ration and example 2 is a typical high efficiency ration which has become increasingly popular overseas. A comparison is made to draw attention to mineral deficiencies, most probably marginal, which are likely to arise where pollard and bran are reduced. The possibility of a deficiency can be guarded against by the inclusion of manganese sulphate and steamed bone flour. The proportion of the different cereal ingredients will of necessity vary according to their availability, quality, and price, and the amounts used must be decided by the mash manufacturers or poultry producers, who must have regard to the relative nutritive values of the foodstuffs at their disposal.

	Example 1	Example 2
	lb.	lb.
Lucerne meal ..	5	5
Bran	10	—
Pollard	20	10
Ground wheat ..	25½	40½
Maize meal	15	15
Barley meal	5	10
Ground oats	5	5
Meat meal	6	6
Milk powder ..	3	3
Ground oyster-shell or ground limestone	5	4
Steamed bone flour	—	1
Salt	½	—
Salt with manganese	—	½
	100	100

Vitamins A and D_3 are to be added according to maker's instructions.

Lucerne meal has been included primarily because it contains a pigment, xanthophyll. Research workers have shown that this pigment is responsible for rich yolk colour. Xanthophyll is present in fresh greens and their dried products and also in yellow maize. A combination of yellow maize and lucerne meal should provide sufficient pigment to ensure a satisfactory yolk colour in eggs. Complaints from the public of "anaemic" eggs sold to them are numerous. Such eggs are unappetising to most people, being a deterrent to consumption.

Poultry producers who do not feed fresh greens to their birds should provide them with an alternative supply of xanthophyll. Some of the higher-class lucerne meals on the market are suitable, though it would be pleasing to see more high-quality samples available. Lucerne as well as providing a rich yolk colour is a good source of carotene, from which birds can utilise vitamin A, riboflavin, and several other essential vitamins.

Quality of Pre-lambing Shorn Wool

By L. F. STORY, Director, and D. A. ROSS and R. L. BRATT, Research Officers, New Zealand Woollen Mills Research Association, Dunedin, and K. H. C. LEWIS, Research Officer, Department of Agriculture Invermay Research Station

THE New Zealand Woollen Mills Research Association, Dunedin, is closely concerned with variations and faults in fleece wools which may affect the manufacturing performance of the wool. In the last few years it has been making trials to find what effect the growing practice of pre-lambing shearing has on the wool as compared with the usual practice of shearing after lambing. Contrary to popular opinion, clips of pre-lambing shorn wool have been found to be much superior in grading as a whole to post-lambing shorn wool from the same flock. Even when the portions suitable for worsted combing are sorted out and processed the pre-lambing shorn wool gives a better performance in the mill.

UNTIL recently it has been customary to shear sheep in New Zealand in late spring or early summer, about 2 months or longer after lambing. However, in the last few years there has been a growing tendency in the South Island to shear in August, a few weeks before lambing begins. This practice has been found to have considerable advantages in sheep management, but the wool obtained is a little different in some characteristics, particularly in that it is usually more open.

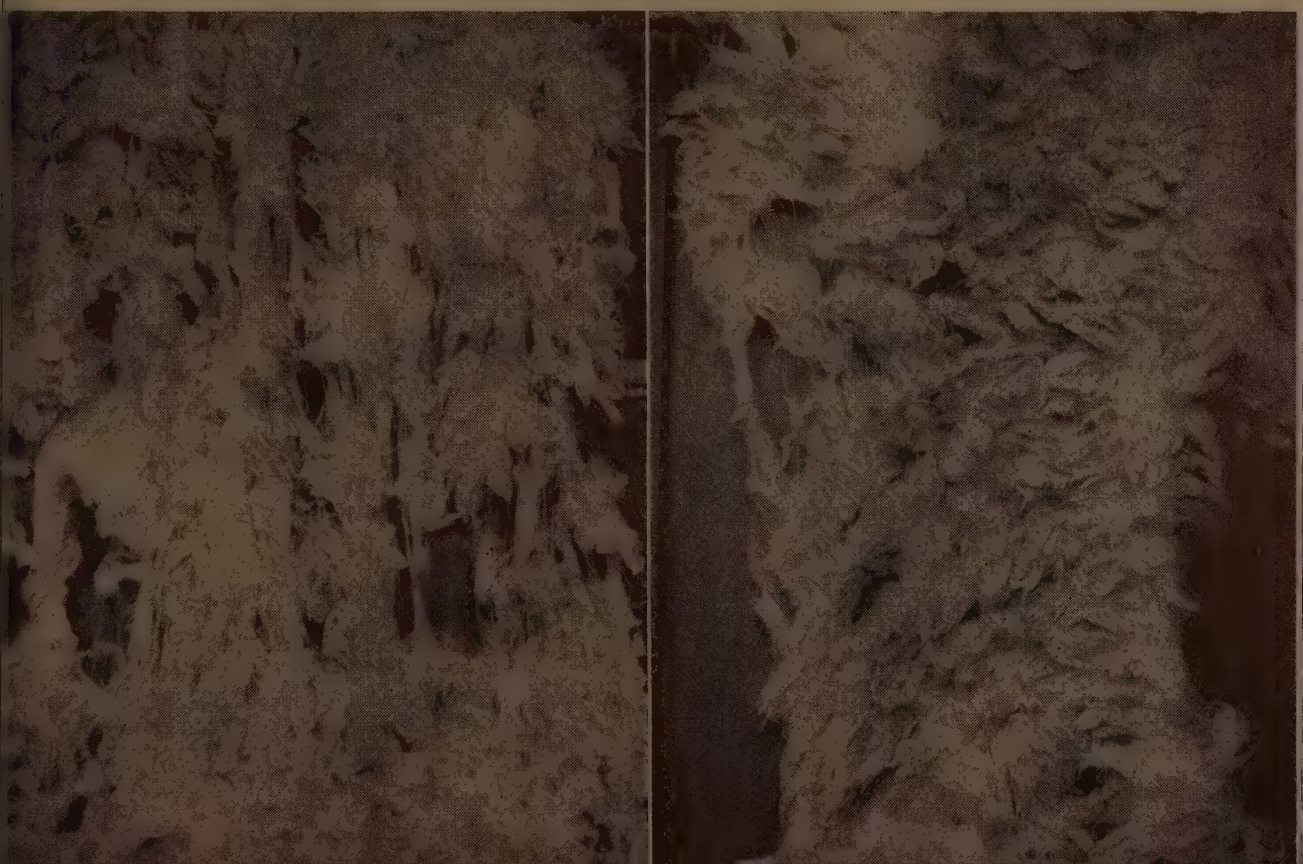
Wool buyers have contended that wool shorn before lambing is unsuitable for worsted processing, so that generally they have not been prepared to pay as much for it. As there is no obvious reason why the wool should be inferior, comparative trials were started to test the contention. Since only the best (sound and well-grown) wools are suitable for worsted combing, whereas any sort of wool can be used in woollen processing, it is obviously desirable to maintain the supply of good wools, especially in view of the competition of other fibres with wool.

Future references in the text to "pre-lambing shorn" will mean wool of 12 months' growth which has been shorn before lambing; the term "early-shorn", which is often used in the trade, should be applied only to wool of less than 12 months' growth.

The Woollen Mills Research Association is not concerned with this shorter wool, as it is usually too short for worsted processing.

Pre-lambing Shearing and Sheep Management

Shearing before lambing has been found by experience to have considerable advantages. Fewer lambs are lost because shorn ewes are more likely to go to shelter to lamb if there is a spell of bad weather; unshorn ewes would stay out and some may lose their lambs. Lambing and suckling are easier, there is no November shearing check for the lambs, and there is less other farm work on hand in August.



▼ Two half fleeces from the same sheep. Left—Shorn in August, before lambing. Right—Shorn at end of November, after lambing.

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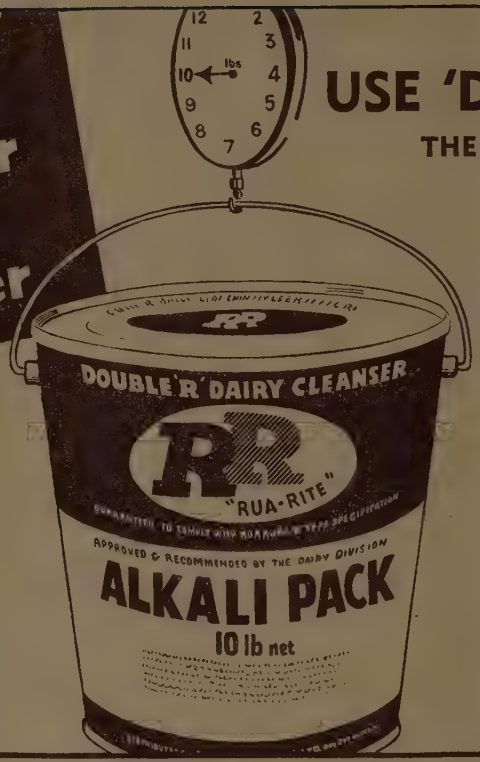

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In addition pregnant ewes do not get cast.

On the other hand shearing of ewes in August is a little more difficult because the grease is stiffer and pregnant animals have to be handled more carefully. Shorn ewes are more difficult to catch at lambing (though use of a crook assists) and bearing trouble (though less likely to occur) is more difficult to deal with. Shearing time is limited, as shearing must be completed before lambing, and there is some risk of loss of sheep if a spell of severe weather occurs soon after shearing in August. However, experience over the last 10 years has shown that this risk is small if reasonable care is taken and the sheep are well fed and kept within reach of shelter for a week or so after shearing.

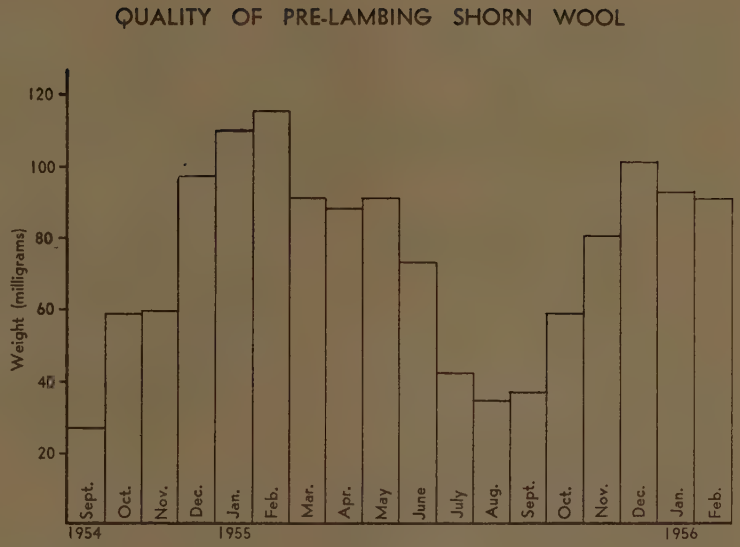
In Otago at least there seems to be a better chance of settled weather in August than in November, when storms with sudden temperature changes often occur. Severe losses after pre-lambing shearing occasionally reported are often found to be due to carelessness.

Generally, the advantages of pre-lambing shearing are considered to outweigh the disadvantages. However, objections are sometimes raised on the ground that it is cruel to the sheep to shear them in winter and so expose them to the cold. These objections can be refuted in two ways: First, the sheep does not have as sensitive a temperature-controlling mechanism in its skin as humans have, and so it does not feel the cold as much, though it does go to shelter if there is a storm. Secondly, if it is cruel to a ewe to shear it in cold weather, how much more cruel is it to its lamb to be born only a few weeks later and to be subjected to a sudden change from heated surroundings within its mother to a cold paddock? Yet nobody gives this a second thought.

Pre-lambing Shearing and the Wool Fibre

The wool fibre is produced in a chamber called a follicle in the sheep's skin. Fresh wool fibre cells are continually being formed at the base of the follicle and gradually push out those previously formed. The wool fibre is hardened into its final form at a point roughly half-way up the follicle, and beyond this point no further changes occur in it—it is dead—though it is continually being extended from below. The growth of the fibre is therefore quite unlike that of vegetable crops, which grow in a season, come to maturity, and are harvested.

There can be no possibility of a stage when the wool fibres are "mature" and more ready for shearing, as is sometimes said. The growth of the wool fibre is exactly the same as the growth of human hair, and no one would suggest that there is a proper season for cutting this; people have their hair cut when it is long enough, and the same applies to wool.



Average weight of clean, dry wool per 100 sq. cm. of skin per day in successive months from 10 Romney-cross ewes.

In crossbred sheep at about lambing time there is often a deterioration in the wool due to a metabolic disturbance. This is shown by thinning, tenderness, or break, depending on the severity of the check, and is often accompanied by cotting and pigmentation. These faults are produced because wool fibres do not grow uniformly. There are large seasonal variations in their average diameter and in the length grown per day.

Rate of Growth of Wool

The Woollen Mills Research Association has recently been making measurements of the rate of growth of wool on a group of 10 Romney crossbred sheep, 5 of which were shorn in August and 5 in November. A sample of the wool was taken at monthly intervals from the same patch on the side of each sheep and numerous measurements were made on each sample. Maximum growth was found to occur in late summer and minimum growth in late winter.

The sheep were owned and managed by the Department of Agriculture's Invermay Research Station and were kept on adequate pasture feed throughout the experiment.

There was no real difference between the two groups of sheep because of the different times of shearing. The average weight of clean, dry wool grown per 100 sq. cm. of skin per day in each of the months is shown in the graph above. The average shape of the wool fibres from the 10 sheep is shown diagrammatically on page 369. In the diagram the length of each section is proportional to the length grown per day in each month and the width is proportional to the corresponding cross-section but

TABLE I—FLEECE RESULTS

(A = Pre-lambing shorn; B = Post-lambing shorn)

	Invermay (Romney crossbred)						Waimate (Corriedale)	
	1953		1954		1955		1955	
	A	B	A	B	A	B	A	B
Average fleece weight (lb.)	8.7	9.3	10.5	9.7	10.6	10.0	7.1	7.3
Average fleece length (in.)	6.9	7.4	7.1	7.0	7.2	7.2	4.8	4.4
	Per cent.		Per cent.		Per cent.		Per cent.	
Total fleeces down graded	27	42	22	53	25	71	39	94
Cotted, tender, break	3	22	5.3	34	2	60	1	62
Wasty only	1.5	—	1.3	—	1	—	4	—
Coloured yolk only	1.5	12	3.3	18	1	1	14	14
Total wool faults	6	34	10	52	4	61	19	76

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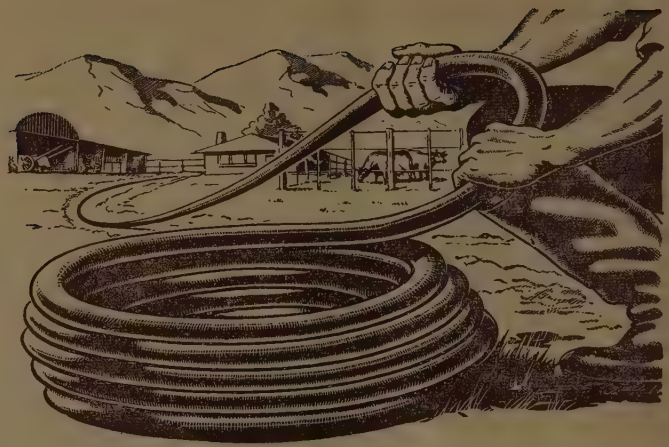

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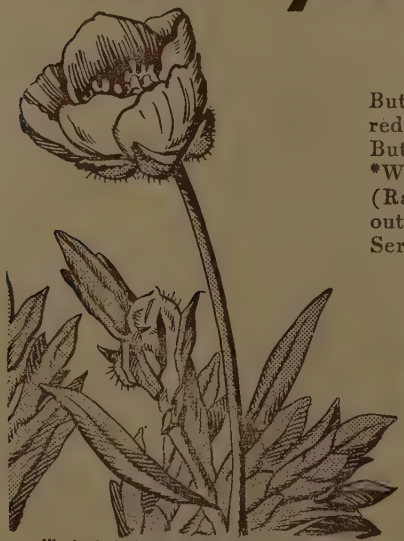
Were your pastures yellow with buttercup?



Illustrated: Creeping (Ranunculus repens)

Buttercup spreads so fast it quickly reduces carrying capacity, reduces butterfat yields, damages good pasture land. Yet Buttercup has met its match in *Weedone. Weedone '57' or *Weedar M.C.P.4 quickly kills creeping and celery-leaved (Ranunculus sceleratus) Buttercup. Weedar M.C.P.4 wipes out Giant Buttercup (Ranunculus acer). See your Weedone Service Distributor. . . . Ask for Technical Sheet T164.

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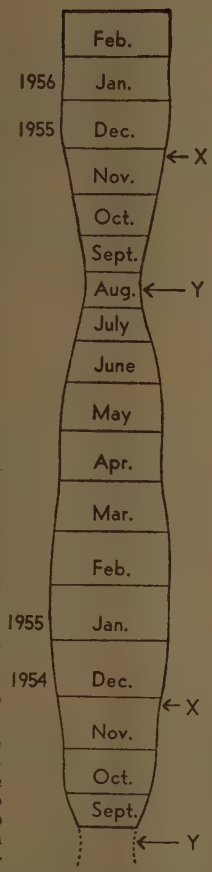
very much exaggerated in proportion to the length.

It will at once be observed that when the sheep are shorn in November (points X,X) the very thin part is included toward the butt of the staples, whereas shearing in August (at points Y,Y) occurs just when the thinnest stage is reached, so that the fibres taper to both ends.



The average changes in length and cross-section of wool fibres from 10 sheep in successive months. The times of post- and pre-lambing shearing are indicated by X,X and Y,Y respectively.

Actually there is a considerably difference between sheep in winter, so that the wool on some sheep becomes much finer than on others. In some sheep many of the fibres stop growing for a time, causing a break in the staple, and if the free ends then become matted, a cot is produced.

Second Experiment

The differences between sheep and between shearing times have been well illustrated by another experiment in which 4 ewes had only one side shorn in August and the other side in November. The August wool from each sheep was sound and open, but the November wool varied from one half fleece that was equally sound and open to one that was tender and quite cotted. The two half fleeces from the worst sheep are shown on page 365 and the difference in the wool from the same sheep due to the difference in shearing time can be seen readily.

Apart from these extreme cases, where a readily observable fault is produced, the November-shorn wool is bound to be thinner above its butt end than August-shorn wool and so is more liable to show signs of tenderness. Thus even an apparently sound November-shorn wool will still have a thin place which will render it more liable to break during processing at the mill.

Effect on Fleeces of Shearing Time

Until the Woollen Mills Research Association started controlled experiments, opinions on the relative merits of pre- and post-lambing shorn wools were based on either a comparison with wool shorn 2 years earlier (in the first year of pre-lambing shearing only 9 months' wool is obtained) or with wool produced on a neighbour's property. In neither case can a true comparison be made, owing to seasonal differences, differences between flocks, differences in feed and management, and variations in other respects. A real comparison can be made only when a flock of sheep is divided at random into two parts, one of which is shorn before lambing and the other after, but otherwise the sheep are all run together and receive exactly the same treatment. This has now been done for 3 seasons at Invermay (Romney crossbred ewes) and one season at Waimate (Corriedale ewes).

At each shearing there has been 12 months' growth of wool. The staple lengths have been measured and the fleeces weighed and graded for fineness and faults. In each season the pre-lambing shorn wool has been practically free from tenderness, break, and cotting, while many of the post-lambing shorn fleeces have been affected by these faults. The average results are given in Table 1. Except in 1953 any differences in fleece weight or length also favour the pre-lambing shorn wool.

During the examination of the wool it has been quite obvious that practically all the pre-lambing shorn fleeces were relatively open woolled, with a tendency to fall to pieces, while the post-lambing shorn fleeces ranged from some that were just as open to others that were quite firmly cotted. It has been said that pre-lambing shorn fleeces are open because "binders" have not developed, and that these are responsible for holding together the fleeces shorn later on. From observations of the appearance of fleeces and the variations between them the Wool Research Association investigators do not believe that "binders" (non-shed fibres running between staples) are responsible for many of the post-lambing shorn fleeces holding together.

A more reasonable and logical explanation (bearing in mind what is known of the rate of growth of wool) is that there is often a very small amount of fibre shedding in winter, followed by very slight cotting and perhaps some rearrangement of fibres into staples, and it is this which is responsible for the fleeces holding together better. With a greater degree of fibre shedding a definite cot is produced; with no fibre shedding an open fleece is obtained, corresponding to the range of fleece types actually observed.

Openness a Sign of Soundness of Fibre

It follows that fleeces that hold together are probably faulty in that this is the first stage of cotting, and the fibres are most likely thin above the butt. On the other hand openness, especially as seen in pre-lambing shorn fleeces, is a sign of soundness of fibre. This view is just the opposite of those generally expressed to the effect that openness is a serious fault. Wool Research Association officers agree that the openness is a disadvantage in handling and sorting the wool, but apart from this it must be an advantage, as it will lead to less fibre breakage during processing.

The length of pre-lambing shorn wool has also been quoted against it. However, in the change-over in shearing times wool of only 9 months' growth will be produced the first year, and this combined with the openness of the fleeces (which makes the wool not conform to the buyers' standard types) is thought to have caused the prejudice against pre-lambing shorn wool. When 12 months' growth is considered little difference in staple length has been found in wool shorn at different times.

Manufacturing Performance

In the manufacturing trials with pre-lambing shorn and post-lambing shorn wool selected wool from the two clips is processed on the worsted system, the two lots following one another on the same machines so that they both get the same treatment. Only the sound combing wool from the two clips is used, and naturally the proportion of this type is considerably lower from the post-lambing shorn clip, as so much of the latter is tender.

The wool is sorted, scoured, carded, combed, drawn, and spun into yarn, and at each stage samples are taken for comparison and measurement. The crossbred wools obtained at Invermay in 1953 and 1954 have been processed in this way and the 1955 Corriedale wool from Waimate was being processed when this article was being written.

In each trial either no difference has been found at any particular stage or the pre-lambing shorn wool has been noticeably superior. The following is a summary of the processing results:—

Classing and sorting: Each time the amount of pre-lambing shorn wool suitable for worsted processing was roughly twice as large as the post-lambing shorn lot, because the latter

QUALITY OF PRE-LAMBING SHORN WOOL . . .

TABLE 2—PROCESSING RESULTS
(A = Pre-lambing shorn; B = Post-lambing shorn)

Wool from	Invermay				Waimate	
	1953		1954		1955	
	A	B	A	B	A	B
Scouring yield (per cent.)	77.9	78.5	75.0	72.3	68.0	66.0
Combing noil (per cent.)	4.3	4.2	4.2	5.7	6.5	8.0
Yarn strength (oz.)	5.5	4.9	6.6	5.6	5.1	4.4

clip contained so much tender wool, which had to be rejected.

Scouring yield: The yield of the pre-lambing shorn wool was slightly the lower in the first trial, but about 2 per cent. higher in the other trials.

Carding: There was no noticeable difference in the amount of fly from the two lots. The pre-lambing shorn scoured wool and card sliver usually had a better (whiter) colour.

Combing: In the first trial, where the staple length of the post-lambing shorn lot had been longer, there was no difference in combing noil (short, broken fibres removed as waste). Subsequently, however, the post-lambing shorn lot gave appreciably more noil and a shorter top. The percentages are shown in Table 2.

Spinning: The pre-lambing shorn wool gave a better spin and an appreciably stronger yarn, as is shown by the results given in Table 2.

Conclusions

The results of the trials show convincingly that pre-lambing shorn fleeces are superior to post-lambing shorn, since they are sound whereas many of the latter are tender. When the combing-type wools from the two clips are processed the pre-lambing shorn wool is still superior in its performance, giving less combing noil and a stronger yarn.

All the differences arise basically from the seasonal variation in rate of growth of wool, which causes a thin, weak place to occur above the butt in post-lambing shorn wool. This weak place is avoided by shearing before lambing and the result is sounder wool.

Acknowledgments

The assistance of Mr. G. Holmes, Superintendent, Invermay Research Station, and Mr. G. Barclay, of Crestlow Station, near Waimate, in providing the sheep and affording facilities for examining the wool, and of the Mosgiel and Roslyn woollen mills, for processing the wools, are acknowledged. Thanks are also due to officers of the Department of Agriculture in Dunedin and Timaru, and to Donald Reid and Co., Ltd., Dunedin, for their assistance in classing and grading the wools.

Agricultural and Pastoral Show Dates

THE following are dates and venues of A. and P. shows up to the end of February:—

NORTH ISLAND

November

*2 and 3 November—Manawatu and West Coast A. and P. at Palmerston North.

3 November—Tokoroa A. and P. at Tokoroa.

9 and 10 November—Whangarei A. and P. at Whangarei.

*9 and 10 November—International Agricultural Aviation Show at Palmerston North.

9 and 10 November—Wanganui A. and P. at Wanganui.

10 November—Clevedon A. and P. at Clevedon.

16 and 17 November—Egmont A. and P. at Hawera.

17 November—Bay of Islands P. and I. at Waimate North.

*17 November—Waihi A. and P. at Waihi.

*22, 23, and 24 November—Auckland A. and P. at Auckland.

December

*1 December—Kaikohe A., P., and H. at Kaikohe.

1 December—Hauraki A. and P. at Paeroa

8 December—Helensville A. and P. at Helensville.

12 December—Ohura Ram Fair at Nihoniho.

January

1 January—Nuhaka A. and P. at Nuhaka.

11 and 12 January—Wairoa County A. and P. at Wairoa.

18 and 19 January—Feilding I., A., and P. at Feilding.

*19 January—Kaeo A. and P. at Kaeo.

22 and 23 January—Rotorua A. and P. at Rotorua.

*25 and 26 January—Horowhenua A. and P. at Levin.

26 January—North Kaipara A. and P. at Paparoa.

30 January—Marton A. and P. at Marton.

February

1 and 2 February—Rodney A. and P. at Warkworth.

2 February—Woodville A. and P. at Woodville.

*2 February—Rangitikei A. and P. at Taihape.

*5 and 6 February—Dannevirke District A. and P. at Dannevirke.

8 February—Dannevirke District Annual Ram Fair at Dannevirke.

8 and 9 February—Taumarunui and District A. and P. at Taumarunui.

8 and 9 February—Taranaki A. and P. at New Plymouth.

9 February—Pahiatua A. and P. at Pahiatua.

9 February—Hukerenui A. and P. at Hukerenui.

13 February—Te Awamutu A., P., and H. at Te Awamutu.

15 and 16 February—Ohura A., P., H., and I. at Nihoniho.

*15 and 16 February—Masterton A. and P. at Masterton.

16 February—Tauranga A. and P. at Tauranga.

16 February—Northern Wairoa A. and P. at Arapohue.

16 February—Waiapu P. and I. at Ruatoria.

16 and 17 February—Franklin A. and P. at Pukekohe.

19 February—Otorohanga A. and P. at Otorohanga.

21 February—Matamata A. and P. at Matamata.

22 and 23 February—Te Kuiti and District A. and P. at Te Kuiti.

22 and 23 February—Wellington and Hutt Valley A. and P. at Trentham.

23 February—Putaruru District A. and P. at Putaruru.

*23 February—Te Puke A. and P. at Te Puke (50th Jubilee).

SOUTH ISLAND

November

1 November—Ashburton A. and P. at Ashburton.

7, 8, and 9 November—Canterbury A. and P. at Christchurch.

14 November—North Otago A. and P. at Oamaru.

14 and 15 November—Marlborough A. and P. at Blenheim (South Island Championship).

17 November—Courtenay A. and P. at Kirwee.

17 November—Taieri A. and P. at Outram.

17 November—Waimate A. and P. at Waimate.

17 November—West Otago A. and P. at Kelso.

23 and 24 November—Nelson A. and P. at Richmond.

24 November—South Otago A. and P. at Balclutha.

December

1 December—Motueka A. and P. at Motueka.

4 and 5 December—Gore A. and P. at Gore.

8 December—Otago Peninsula A. and P. at Portobello.

8 December—Wyndham A. and P. at Wyndham.

11, 12, and 13 December—Southland A. and P. at Invercargill (Centennial).

15 December—Tokomairiro A. and P. at Milton.

January

12 January—Blueskin A. and P. at Waitati.

26 January—Palmerston and Waihemo A. and P. at Palmerston.

26 January—Waiau A. and P. at Tuatapere.

30 and 31 January—Otago A. and P. at Dunedin.

February

16 February—Murchison A. and P. at Murchison.

23 February—Kaikoura A. and P. at Kaikoura.

* The Department of Agriculture exhibit will be staged at this show.

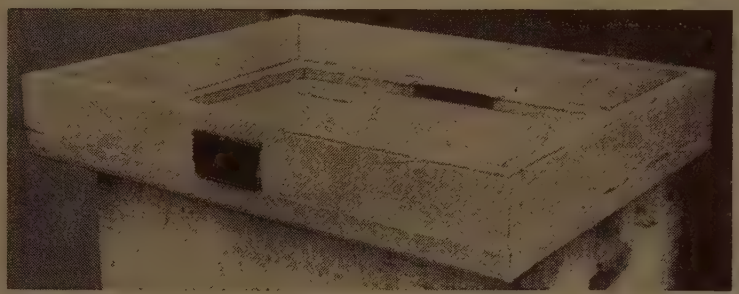
Hive Covers

THE hive cover or lid is really a roof to protect the colony from rain, snow, wind, or sun. Hence the material used should not only be waterproof, but should insulate the colony against excessive heat or cold.

IN this article L. H. Johnson, Apiary Instructor, Department of Agriculture, Palmerston North, discusses defects that are common in hive covers in New Zealand apiaries and how they can be improved.

Though the construction of a hive cover calls only for elementary carpentering skill, the numbers of badly made covers on hives gives the impression that this item of equipment is one of the most difficult to make. This charge of apparent incompetence cannot be levelled at the domestic beekeeper only, for it also includes many commercial beekeepers of years' standing. Some covers fit too tightly, some are too loose, and others do not fit at all. The difficulties encountered with the use of this irregular equipment are often further aggravated by trying to match these assorted lids with hive bodies of various sizes.

Telescopic cover, showing ventilator on one side.



Under side of telescopic cover.

Flat covers made with three layers of thin boards placed criss-cross and covered with metal but without side pieces to telescope over the hive bodies have been in use for years. These rather heavy covers used without mats do not readily blow off with the wind, but they are neither watertight nor bee tight. Several thousands of them that have been made and are in use must eventually be thrown on the scrap heap.

Bitumin drums have been cut down and fashioned into hive covers. The corners have to be welded. They are rough and without any insulation value, but may be serviceable for years.

Concrete covers have been used, but it is not likely that they will ever become popular, because of their weight and the damage they receive in handling.

Among domestic and side-line beekeepers are found a great assortment of covers. Some hives have nothing better than a sack thrown on top and over this a piece of corrugated iron weighted down with large stones or heavy pieces of metal. Some beekeepers appear to think that if they add piece after piece of flat iron, such a cover is bound to be watertight.

It is quite common to find very steep gable covers used without a mat or inner cover. Bees build comb in the space above the frames, making removal of the cover difficult.

In other apiaries the covers have been securely tied on with wire. To remove a cover under these conditions irritates the bees and the bee inspector, while this and any of the foregoing types of covers must be a deterrent to the owners to examine and care for the colonies.

These unshapely hive covers are very unsightly and often cannot be painted to improve them.

In view of the fact that good factory-made covers can be obtained in any part of the Dominion it might be thought that few sub-standard hive covers would be in use and there would be no need to call attention to them. However, those with first-hand knowledge of just how many unsatisfactory covers exist feel that it is high time that such irregular hive parts were abandoned and replaced with standard parts. Not only would such an improvement be welcomed by those who inspect hives, but the owners could take more interest in their hives and find them much better to work.

Standard Hive Equipment

The most popular hive cover is the telescopic flat top. It is the simplest to make, requires the minimum of material, and has a pleasing appearance. In addition to its prime use, the cover placed on the ground is ideal to sit supers on during hive examination. During transport or for storage telescopic covers may be stacked one on top of the other much better than gable covers.

The inside measurements are 20½in. by 16½in. by 2in. deep so that it will telescope over a standard hive body, which is 20in. by 16in. This amount

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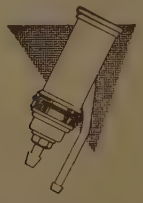

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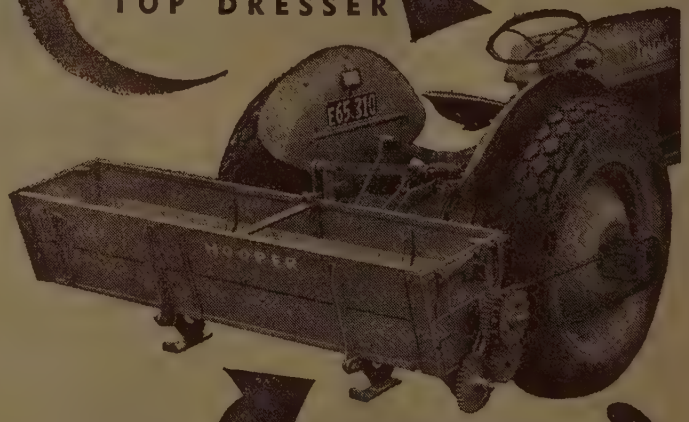

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of clearance is not sufficient to admit robber bees.

Damp Hive Mats

The flat cover has the disadvantage that the hive mat under it is often damp. Very often this is the result of a defect in the cover which admits rain-water.

If the top covering material is to be galvanised plain iron or sheet aluminium, it should be cut at 20in. by 24in. as a minimum size to cover the side pieces which telescope over the hive body. The sizes of iron available (30in. and 36in. wide by 60in. or 84in.) will not cut without waste.

The all too common defect is that the iron is cut too skimpily and allows water to seep in above the wood forming the sides of the cover. The mat should not overhang the sides of the

An apiary with gable covers.

Cover that does not telescope, but sits on top.

Flat covers with bituminised paper sandwiched between the boards.

Part of a poorly kept domestic apiary. Removing and replacing the bits and pieces on top of a hive take more time than examination of the colony.

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hive or it will soak up rain-water like a wick.

Condensation

In some localities condensation appears to be a factor complicating the provision of satisfactory hive covers. Warm, moist air from the cluster of bees rises but has no escape, and when it meets the cold coming through the cover condensation occurs.

Many different ideas have been tried to overcome this condition. Hive covers have been used without mats. Condensation may still occur, but moisture is partly absorbed by the wood in the cover and what is surplus drips to the floor board. Wintering the colony with a full-width summer entrance helps, but the hive is not warm enough. Field mice can also enter the hive through the larger entrance.

It is essential that damp mats be changed for dry ones, as dampness provides the best conditions for rot fungi to attack the wood in the cover.

Top Ventilation

There is nothing new about top ventilation. It has been tested for some years in this country and abroad, but only recently has it received the attention it deserves. Many of the desirable conditions obtained by providing the colony with a top entrance are due to better ventilation.

Vapour given off by the bees may escape at the top, thus minimising condensation. Despite all their disadvantages, gable covers are still popular in districts with high humidity, because they keep the top of the hive dry in all weathers. This may be attributed to the design, which provides air space above the mat and has ventilators in the gables.

Hives with loose-fitting covers are often dry. Ventilators are needed more for flat covers than for other types. They may be made in the following way:—

Strips of wood ⅞in. wide by ½in. thick are fixed to the underside of the cover next to the outer edges. These strips will rest on the top edges of the hive body and provide a ½in. air space between the mat and the cover when it is in place. On either side just below the ceiling an opening 1in. by ½in. is cut out of the downward projecting sides of the cover and through the ⅞in. by ½in. strips so that moist air in the space above the mat may escape outward.

The opening should be cut with a slope to the outside so that rain-water will not run in. These ventilators may be cut out with a dado head before the cover is assembled. Two ½in. holes bored with a similar slope on either side of the cover will also serve the same purpose. In either case the openings should be covered with brass gauze and fixed with tacks of the same metal.

Holding Covers on

A first requirement in having hive covers that stay on is that apiaries should be sheltered from strong winds. This, however, is not always possible. Beekeepers do not seem to have invented a universal, standard fastener to hold a cover on; stones or bricks piled on top still seem the most common means of securing covers.

If all hive covers were made to a standard and all hand holds were the same, it might be more practical to get a fastener that would form a link between the two. Loose parts that could be lost or projections that might be damaged in use would not be satisfactory. What appears to be wanted is a fastener that is part of the cover so that it may be locked in position when put on the hive.

Radio Broadcasts to Farmers

RADIO broadcasts to farmers will be given during November as follows:—

1XH Hamilton, 12.33 p.m.

12 November—"Weaning Lambs", by G. R. Mackintosh, Livestock Instructor, Department of Agriculture, Hamilton.

19 November—"Recent Developments in Weed Control", by F. B. Thompson, Department of Agriculture's Soil Research Station, Rukuhia.

26 November—"Conditions Abroad as I Found Them in 1956", by A. B. Baker, Federated Farmers.

1YZ Rotorua, 7.15 p.m.

8 November—"Dipping of Sheep", by M. B. MacKenzie, Livestock Instructor, Department of Agriculture, Tauranga.

22 November—"Winter Crops for Cows and Pigs", by G. A. Blake, Instructor in Agriculture, Department of Agriculture, Matamata.

28 November—"Questions and Answers", by S. W. Rees, Supervisor, Bay of Plenty District Pig Council.

2XA Wanganui, 8 p.m.

1 November—"For the Country Woman", by Mary Macdonald.

8 November—"The Radio Vet.", by S. Jamieson, Veterinarian, Department of Agriculture, Wanganui.

15 November—"Breeding Troubles Experienced in Sows and Boars", by C. M. Bailey, Supervisor, Taranaki District Pig Council.

22 November—"Shearing Lambs", by G. J. Ball, Sheep and Wool Instructor, Department of Agriculture, Wanganui.

29 November—"Dipping Sheep", by J. F. Munting, Livestock Instructor, Department of Agriculture, Wanganui.

2YZ Napier, 7.10 p.m.

6 November—"Seasonal Notes", by F. H. Collin, Fields Instructor, Department of Agriculture, Hastings.

20 November—"Common Diseases of Livestock", by J. J. Byrne, Veterinarian, Department of Agriculture, Hastings.

2ZA Palmerston North, 12.33 p.m.

5 November—"Precautions at Shearing Time", by C. R. M. Jones, Livestock Instructor, Department of Agriculture, Dannevirke.

12 November—"Oversowing and Topdressing of Hill Country", by L. W. Blackmore, Instructor in Agriculture, Department of Agriculture, Dannevirke.

19 November—"Spraying of Farm Orchards", by G. N. Paulin, Horticultural Inspector, Department of Agriculture, Palmerston North.

26 November—"Blind Seed Disease", by A. V. Lithgow, Officer in Charge, Department of Agriculture Seed Testing Station, Palmerston North.

3YA Christchurch, 12.20 p.m.

5 November—"Hydatid Disease", by A. C. Howse, Veterinarian, Department of Agriculture, Christchurch.

19 November—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Instructor in Agriculture, Department of Agriculture, Rangiora.

4YZ Invercargill, 7. p.m.

6 November—"Preparation for Shearing", by W. F. Dick, Sheep and Wool Instructor, Department of Agriculture, Invercargill. "Weed Control of Brassicas", by T. Sewell, Instructor in Agriculture, Department of Agriculture, Gore.

13 and 20 November—"Use of Farm-grown Timbers", by C. H. Brown, Forester, New Zealand Forest Service, Invercargill. "Increasing the Wool Clip", by W. F. Dick, Sheep and Wool Instructor, Department of Agriculture, Invercargill.

27 November—"Lucerne Growing", by L. Reid, Fields Instructor, Department of Agriculture, Gore. "Pasture Management", by W. Faithful, Instructor in Agriculture, Department of Agriculture, Invercargill.

Regular Broadcasts

1XH Hamilton, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8 p.m. (Northland livestock report and "Farming for Profit"), Wednesdays at 8 p.m. ("Farming for Profit"), and Fridays at 8 p.m. ("News for the Farmer").

1YA Auckland, Mondays at 12.33 p.m., Tuesdays, Wednesdays, and Thursdays at 7.45 p.m., and Fridays at 6 p.m. and 7.45 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month), Thursdays at 12.33 p.m. and 7.15 p.m. (fortnightly).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m. Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawke's Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawke's Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Mondays and Thursdays at 12.33 p.m.

4YA Dunedin, Tuesdays at 12.33 p.m., Wednesdays at 7 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m., Tuesdays at 7 p.m.

Care of Livestock during November

[*H. E. Clark*
Contributed by the Animal Research Division

DRY sows should have access to good pasture and in addition should receive from 2 to 4 gallons of milk per day, depending on their condition. They should be kept thriving, but not allowed to become too fat. Keep only as many of the spring litters for baconers as can be fed adequately; the remainder should be sold as porkers.

CARE OF PIGS

Vaccination has reduced the New Zealand average rate of abortion in dairy cows from about 5 per cent. to 1 per cent. However, there are still too many dairy farmers who do not vaccinate their calves. Past freedom from abortion is no excuse for not vaccinating, as infection may be introduced into a herd at any time. Though vaccination does not begin until January or February, applications should be made now, as veterinarians and Livestock Instructors have to plan their vaccination itineraries.

VACCINATION AGAINST CONTAGIOUS ABORTION

Late applications make this planning very difficult. Calves should not be vaccinated until they are over 4 months old. Poor immunity results if they are vaccinated before this.

During the season of maximum grass growth the problem is to control pastures at their most leafy, nutritious stage. This is best achieved by conserving all growth surplus to requirements as silage and hay. Later in the season it is important to maintain sufficient pasture cover to ensure growth during the dry, summer period. As grass growth declines the period in which paddocks are spelled between grazings should gradually be increased and as much silage as the cows will clean up should be fed out.

GRAZING MANAGEMENT OF DAIRY PASTURES

If ewes have not already been removed from the flock, they should be separated immediately. It is a good plan to shear them and during shearing they should be inspected carefully for udder abnormalities.

DRY EWES

All ewes whose udders were empty at lambing and ewes with diseased udders, damaged teats, very large teats, very small teats, or badly placed teats should be culled. Dry ewes with defective mouths and old ewes which did not have a lamb this year should also be culled.

Dry ewes which are retained should not be allowed to get too fat during the summer. If kept in hard store condition, they are more likely to hold when mated next autumn.

Pastures on which ewes and lambs are grazing should never be allowed to become rank. If pastures are getting too long, they can best be controlled by cattle. Yearling beef cattle soon become quiet and they can then be run with ewes and lambs even in small paddocks.

CONTROL OF FAT LAMB PASTURE

Preparations for shearing should be made now. Attend to sheepyards and scrub out the woolshed. This will reduce trouble from such diseases as blood poisoning, tetanus, and caseous lymphadenitis ("lympho") after shearing. Check over all machinery to see that all parts are in good working order. Dag all dirty sheep and shear hoggets, wethers, dry ewes, and rams.

SHEARING PREPARATIONS

When culling sheep before shearing pay particular attention to teeth, udder, and dropped belly. On fat lamb farms ewes are best shorn after one or two drafts of lambs are away.

Rams should be dipped before they begin to flush, preferably before Christmas; flushed rams sometimes scald after dipping.

DIP RAMS EARLY

"Pasture Production in New Zealand"

"NEW ZEALAND'S grassland covers about 31,000,000 acres and feeds about 38,000,000 sheep and 5,750,000 cattle. These in turn convert the produce of this grassland into about 225,000 tons of butterfat, 195,000 tons of wool, and 600,000 tons of meat each year.

"The grassland covers a very wide range of climatic and soil conditions and ranges from lowland swamp pastures to cold and dry hill pastures of some of the mountainous regions. During the time that New Zealand has been farmed vast changes have been made in its vegetative cover, mainly in order that livestock may be properly fed."

These two opening paragraphs of the latest edition of "Pasture Production in New Zealand", Bulletin No. 250 of the Department of Agriculture, introduce a comprehensive and detailed discussion of the most important factor in New Zealand's economy, pasture production.

S. H. Saxby, Agrostologist, Department of Agriculture, the author of the bulletin, has divided it into sections on grasses, clovers and allied plants, and pasture management.

The conditions under which the various grasses and clovers are most useful are described and distinctions are made to aid recognition of grasses of similar appearance.

The bulletin's value is enhanced by a great number of illustrations.

The publication can be obtained from main offices of the Department of Agriculture for 2s. 6d. a copy.

Summer Pasture Management and Crop Production

Seasonal Notes by the Extension Division

SEASONAL pasture management on dairy farms should aim at the full control of late spring and early summer growth through controlled grazing, topping rank feed, and conservation of surplus summer growth as silage (and later as hay). In late spring it is difficult to keep pastures evenly grazed and the simple work of topping with the mower secures even and more prolonged recovery.

TOP EARLY

FARMERS should aim to top pastures in November and early December while satisfactory recovery may be expected; it is generally unwise to top after the middle of December. Topping calls for a much higher setting of the mower to leave a fair amount of leaf though cutting off the bulk of the seed head growth. The forage harvester set at a fairly high cut is a useful tool on larger farms where this surplus growth can be used as silage or hay. Light toppings can be easily dealt with by stock. As an aid to weed control topping should be done to a greater degree. Many tall-growing weeds will be checked and their growth evened up so that spraying can be done more effectively. Checking of weeds by this means helps in thickening up the grasses and clovers.

—J. R. MURRAY

* * *

NOVEMBER TOPDRESSING

RAINFALL is a major limiting factor to dairy pasture production throughout most North Island summers. By topdressing in November with superphosphate (and potash also if needed) a more vigorous and dense cover for pasture is secured which will keep the soil moister and result in better summer and autumn production. If topdressing is left too late, however, insufficient rain may fall to encourage the required summer growth. If the pasture is again to be topdressed in autumn, 2cwt. of superphosphate is all the phosphate that need be applied in November. All fields being grazed and aftermaths of silage fields can be topdressed in November to provide extra summer feed.

—N. WALBRAN

* * *

LUCERNE IN NORTH CANTERBURY

THE time of sowing lucerne in North Canterbury is governed by its place in the crop rotation as well as by climatic conditions. Where it follows crops such as rape or a cereal it is usually drilled in late September or early October after a winter fallow. On land where the risk of serious weed invasion is not great this early seeding has much to commend it, for it ensures an adequate supply of moisture, sufficient warmth for rapid germination, and a long growing season for the establishment of the young plants. Should dry weather be experienced during summer, it will be found that the lucerne roots have penetrated to such a depth that the plant is not seriously affected. Autumn sowings should follow a summer fallow and are generally carried out in late January or during February.

Opinions vary regarding the rate of seeding, but 10lb. per acre of culture-treated seed is near the ideal. Broadcasting is not usually favoured, and though sowing one way in 7in. drills is the most common method, several drill attachments which give a better spread of seed are rapidly gaining popularity. Lime deficiencies should be rectified before sowing and a 50-50 mixture of lime and superphosphate drilled with the seed ensures rapid early growth. The importance of shallow drilling has frequently been over-emphasised, and seed placement at a depth of 1in. is recommended. Shallower sowings may result in a high death-rate of seedlings or the spoiling of culture during a dry spell. Brush harrows following the drill complete the job, for rolling directly after sowing is not advisable, particularly on soils that are inclined to crust after rain.

—E. G. SMITH

* * *

WEED CONTROL IN PEAS

THE pea crop is usually given its place in a rotation after pasture, partly because that is the time when the least weeds are likely to compete with the crops and partly because of the higher fertility of the soil, this latter condition ensuring optimum growing conditions and maximum competition for any weeds that survive the subsequent cultivation. After drilling, most subsequent mechanised weed control is done with the harrows. Before there is any chance of damage to the young pea shoots one or even two pre-emergence harrowings may be given, this being made possible by the fact that the seed is usually drilled about 2in. deep. Beginning when the plants are about 2in. high, two or three more harrowings may be given until the time that the tendrils begin to form on the growing pea plants. Another method is the use of row spacing of 14in. or 21in., weed control being attained by regular inter-row cultivation. This method makes use of a lighter per acre seeding rate without any apparent reduction in yield.

CHEMICAL CONTROL

In the past few years many acres of peas have been kept free of weeds by the use of chemicals. Chief of the materials used is the yellow phenol or DNBP weedkiller. Good kills of annual weeds such as fat-hen and wild turnip can be obtained by applying this material after the peas are 2in. to 3in. high and while the weeds are very young. Rates used vary between ½lb. to 1lb. phenol equivalent per acre. Best results are obtained when the temperature is in the 60 to 70 degree range, the higher rate being necessary if temperatures are lower. The disadvantages of this chemical are that in a dry season poor weed control results if the weeds are not treated when very young (seedling stage), no control of perennial weeds is obtained, and because it is extremely poisonous special equipment has to be used to apply the material with safety.

Where perennial weeds such as Californian thistle were a problem the water soluble salts of MCP at up to ¾lb. per acre have been used in the past. This chemical usually reduced yields, but this yield reduction was often offset by the greater damage that would have occurred through the smothering of the crop by Californian thistle. More recently a new compound, the sodium salt of MCPB, has proved very promising in initial trial work. This chemical shows a greater selectivity to peas than the water soluble salts of MCP and has none of the disadvantages of DNBP. It will almost certainly replace both DNBP and MCP for weed control in peas. At rates of up to 1lb. per acre MCPB has given good control of annual weeds and perennial weeds such as Californian thistle without visible yield reduction. If annual weeds are prevalent, the application should be made as near to the seedling stage as possible. If perennial weeds that arise from root suckers are dominant, the application should be delayed but should be made before the weeds offer too much competition. Further work may show that the water soluble salts of MCPB will be suitable for the control of weeds in partridge peas, one of the most susceptible pea varieties.

—A. J. EBERT

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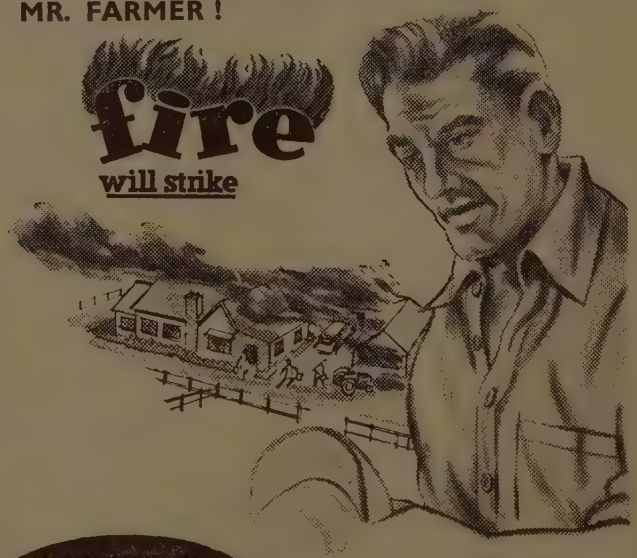

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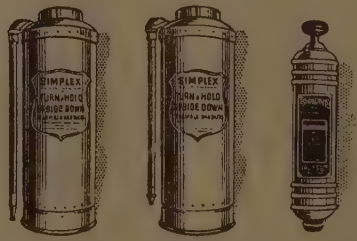

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The Value of Nurse Crops

THE factors which must be considered when the value of nurse crops is being assessed are discussed in this article by A. R. Rankin, Fields Instructor, Department of Agriculture, Invercargill. The sowing of pasture under cover of a crop is fairly common in Southland, particularly in the arable farming districts, and though it can be claimed that this method of pasture establishment has several advantages, it also has several disadvantages.

FARM management policy is undoubtedly a deciding factor when the method of pasture establishment is being determined. Though some methods of establishing pasture are more satisfactory than others, consideration must also be given to the cropping rotation, the power unit on the farm, and available labour. All these factors affect the farm management programme, and in many cases the sowing of nurse crops becomes an essential feature of the plan. The cultivation bill is reduced, and in addition the unproductive period which normally occurs between utilisation of the crop and resowing to grass is eliminated.

However, though sowing out to grass with nurse crops often fits in well with the farm management programme, the results obtained are often most disappointing. The sowing of grass seed is expensive and it thus becomes important to obtain the maximum production from the grass. Poor establishment and even partial failure of the pasture are costly. It is recognised that generally successful pasture establishment is more difficult when seed is sown under a nurse crop. This, of course, does not always apply, as there are areas where the sowing of a nurse crop is helpful and indeed essential for successful grass establishment. This applies principally to fine, sandy, or light soils exposed to strong winds. The protection given by a quick-growing nurse crop in these circumstances is of great value. The greatest value is obtained when the nurse crop is fed off in an early stage, this being preferable to harvesting the crop.

Danger of Smother

The provision of early feed, reduced cultivation, or the obtaining of a cash crop are often the underlying reasons for sowing out with a crop, no consideration being given to the use of the crop as a form of protection.

When a pasture is being sown down a light seeding of rape or turnips provides early feed and does little harm to the pasture.

Under such circumstances the nurse crop can be harmful, owing to its smothering effect. Individual pasture plants are weakened and the ability to tiller is reduced. This setback can often extend a long time into the life of pasture, and, indeed, the pasture may never fully recover.

This is a point which must be given the fullest consideration when a decision is made as to whether to sow out with a nurse crop or not. Frequently the more obvious advantages of saved time and cultivation relegate to the background the possibility of impaired pasture.

Type of Crop

Turnips

The degree of smother depends first on the crop which is sown and secondly on the seeding rate of that crop. Turnips as a nurse crop are probably the most satisfactory, but even here the seeding rate needs to be carefully adjusted to reduce smother to a minimum and yet obtain sufficient feed from the turnips to make the sowing worth while. A seeding of 3oz. to 5oz. of turnips per acre can do very little harm, and under careful grazing and management a good pasture will be obtained. It is important, however, that there is no overgrazing in an effort to clean up the turnips, and precautions must also be taken to ensure that in wet weather feeding off the turnips does not result in poaching with subsequent weakening of the pasture. Rape when used as a nurse crop provides an excellent example of how such a crop can cause pasture deterioration because of the dense smother which normally takes place.

Rape

In Southland the introduction of Club-root Resistant rape has made undersowing with grass more risky than previously, when club-root disease reduced the rape growth, which in turn favoured grass establishment.

The two methods usually adopted in sowing rape as a nurse crop are broadcasting ½lb. of rape per acre with the seed, or alternatively sowing the rape through every second coulter of the drill with the grass seed box attached. If the latter method is used, it is usual to sow the rape at a slightly heavier rate, but even then more than 1lb. per acre would be unwise.

Cereals

Cereals are also often used as nurse crops for pasture. If it is the intention to obtain only a temporary pasture which will be ploughed again about 2 years later, the practice has some justification, but otherwise it is generally too risky for sowing permanent pasture. Not infrequently a good pasture results in the second year after sowing, especially with moist conditions on heavy land, but there are also many instances where the value of the pasture is perman-

ently reduced. When sowing with pasture seed a cereal crop which it is intended to harvest, it is not usual to reduce the cereal seeding rate, the tendency being to give as much consideration to the crop as to the pasture.

Competition for Moisture

In a dry season there can be very marked competition for soil moisture and the pasture, besides being adversely affected by smother, also suffers from lack of soil moisture. The smothering effect is usually more severe on grass than on clover; thus a cereal nurse crop can on occasions prove valuable in assisting clover establishment, particularly in areas where difficulty is experienced in this respect. A further alternative in sowing cereals as nurse crops is to sow in February or early March and use the area for greenfeed. Oats, barley, and ryecorn are most commonly chosen, the seeding rate varying between 1 and 1½ bushels per acre for the cereal.

Fertilisers

Naturally the application of fertilisers is important, as the crop competes directly with the pasture. Thus adequate topdressing is essential. Recommendations can only be taken as a guide, because fertiliser requirements vary in different areas, but generally 1 ton of lime per acre should be applied before sowing and 2cwt. to 3cwt. of superphosphate per acre at the time of sowing. After the crop has been utilised a further application of 2cwt. of superphosphate per acre assists the pasture. In certain areas, particularly where the crop has been harvested instead of fed off, potassic superphosphate may prove advantageous.

When viewed purely from the point of view of pasture establishment undersowing with nurse crops cannot be regarded as the best method. The possibility of failure or partial failure is always present. At the same time the practice is widely adopted, in many cases with reasonable success. Modification of seeding rates and other practices may assist to eliminate past failures, though pasture is, in the majority of cases, best sown alone. On the other hand, departure from a policy of undersowing with nurse crops could mean extra cultivation and labour, with rearrangement of the farm management policy, and possible capital outlay to meet the increased cultivation programme. Consistent pasture establishment failure would make a change necessary, but if failures are not experienced too often, the risk is possibly worth taking.

N.Z. Grassland Association Conference

OVER 100 overseas visitors will attend the annual conference of the New Zealand Grassland Association to be held at Canterbury Agricultural College, Lincoln, from Tuesday 27 November to Thursday 29 November. The programme is as follows:—

27 November

"Grassland Development over the Past 25 Years", Dr. W. Davies, Director, Grasslands Institute, England. Presidential address by Professor J. W. Calder. "Techniques of Land Development in New Zealand", P. W. Smallfield, Director, Extension Division, Department of Agriculture. "Canterbury Pastures in Relation to Cropping and Small Seed Production", E. G. Smith, Instructor in Agriculture, Department of Agriculture, Rangiora. "Problems of Managing Grassland under Low Rainfall Conditions in Australia", Dr. J. Griffith Davies, Associate Chief, Plant and Soils Laboratory, C.S.I.R.O., Brisbane. "Problems of Managing Grassland under Low Rainfall Conditions in South Africa", Professor J. D. Scott, Professor of Pasture Management and Soil Conservation, University of Natal. "Review of Recent Work in Trace Element Deficiencies in Australia", H. J. Lee, Principal Research Officer, Division of Biochemistry and General Nutrition, C.S.I.R.O., Adelaide.

28 November

"Economics of Farming on Light Land in Canterbury", R. H. Scott, Land Utilisation Officer, Department of Agriculture, Wellington, and R. C. Stuart, Agricultural Economist, Department of Agriculture, Christchurch. "Light Land Pastures", C. E. Iversen, Senior Lecturer in Agriculture, Canterbury Agricultural College. "Some Results and Problems from Experiments at Winchmore Irrigation Research Station", G. K. McPherson, Irrigation Research Officer, Department of Agriculture, Winchmore. "Problems of Irrigating Grassland in Canterbury", C. Hilgendorf, Mid-Canterbury farmer.

During the afternoon there will be a field trip to Ashley Dene, the Canterbury Agricultural College light land farm.

29 November

"High Country Grazings in New Zealand, Characteristics and Problems", L. Chapman, Ashburton Gorge farmer. "Rangeland (U.S.A.)", Professor R. Merton Love, Professor of Agronomy, College of Agriculture, University of California. "Tussock Grassland Problems under Investigation in New Zealand", J. Hercus, Instructor in Agriculture, Department of Agriculture, Alexandra. "Grazing Standards", Dr. Lincoln Ellison, Chief of the Division of Range-management Research, Intermountain Forest and Range Experiment Station, Forest Service, Utah. "General Grassland Problems in the Netherlands and Neighbouring Countries", Dr. M. L. t'Hart, University of Wageningen. "Silage Investigations with High Protein, Unwilted Forage at New York State College of Agriculture", Professor W. K. Kennedy, Professor of Agronomy, New York State College of Agriculture. "A Comparison of Grassland Problems in Great Britain and New Zealand", Professor M. M. Cooper, School of Agriculture, University of Durham.

Government-approved Turnip and Swede Seed

NEW ZEALAND Government-approved turnip and swede seed for distribution this year has again been made into a single blend for each variety. The seed is packeted in 1lb. and 2lb. calico bags, and containers have been stamped with the letter B as an identification mark.

With the exception of N.Z. Victory Yellow, which has a germination of 84 per cent., the germination of seed of all varieties of Government-approved turnip and swede seed being distributed in 1956 is 90 per cent. or better.

Some criticism has been raised of the practice of publicising the code letters used to identify the different releases of Government-approved turnip and swede seed, but this criticism seems to have been caused by misinterpretation of the significance of the code letters.

Some retailers may have on hand seed carrying the identification mark of an earlier season's distribution. This does not indicate that the seed is in any way inferior to that of the current distribution. However, it is desirable that such seed should be retested for germination before sale so that the usual practice of selling seed on a recent germination test may be maintained. Farmers need have no hesitation in using such seed if the sale is supported by a recent certificate showing a satisfactory standard of germination.

A considerable quantity of turnip and swede seed not grown under Government supervision is offered for sale by reputable merchants. This seed has been grown for or by them and does not carry the Government mark. Absence of this mark does not necessarily suggest that seed so offered is inferior in type or germination.

Production of Bees and Prevention of Swarming

Seasonal Notes for the Domestic Beekeeper

By A. W. BENNETT,
Apiary Instructor, Department of Agriculture, Hamilton

TO obtain a good crop of honey the beekeeper must concentrate on building up a large force of bees to be ready to gather the nectar when the main flow begins. At the same time precautions have to be taken to prevent the loss of these valuable bees by excessive swarming.

THE maximum number of foraging bees can be secured only by providing the queen with extra accommodation to produce them in. To do this an extra super must be given so that the queen will have access to approximately 12 to 15 good brood combs. If the hives have been wintered in a single box, the new super can be placed on top. This should have really good drawn-out combs so that the queen can make use of them almost immediately.

If a supply of these combs is not available, frames fitted with new sheets of foundation will have to be used. When this super is added a comb of honey should be brought up from the bottom and placed near the centre of the new combs. This manipulation appears to attract the bees more quickly up into the new combs. In a very short time the queen will have begun to lay in them.

As the brood in the bottom combs begins to hatch out a very rapid increase will be noticed in the colony strength of the hive. At this stage a very close watch has to be kept on the food supply. In fine weather there may be sufficient nectar being gathered to feed the increasing amount of brood.

Never let the food supply get too low or the queen will retard her egg laying in this critical period when maximum egg laying must be encouraged. To maintain the food supply at the correct level artificial feeding may have to be carried out. This can be done by supplying extra combs of honey or feeding sugar syrup.

A hive carried over the winter in two supers can be encouraged to produce more bees by a little readjusting of the combs. As many combs of brood as possible should be put down into the bottom box. It is best to have a comb of honey for the outer comb on each side; otherwise brood in these two combs might very easily get chilled in a cold snap. Honey and pollen in any of the remaining combs can be placed on the side of the top super and good empty combs or comb foundation should go into the centre. In this way a hive producing the maximum number of bees will be obtained in a very short time.

If a hive does not respond to such treatment, consideration should be given to replacing the queen at the earliest possible opportunity. Sometimes bees take it on themselves to replace such a queen.

This supersedure of the old queen by a young one can generally be recognised by the presence of one or two queen cells about the centre of a brood comb. The first young queen to hatch out will destroy the remaining cell or cells and in time begin to lay.

Sometimes the old queen is destroyed immediately, but on other occasions the two queens can be found apparently leading a peaceful existence within the hive. Eventually the old queen disappears and the hive is then headed with a young queen. Unfortunately bees cannot be relied on to carry out this queen supersedure systematically and at the correct season of the year.

Swarm Control

Several factors have a bearing on excessive swarming. They are:—

1. Bad ventilation in the hive. This can be rectified by keeping the entrances free from grass and, if the hive is very sheltered, by increasing the size of the entrance.
2. Overcrowding. Though it is desirable to encourage an increase of bees at this time, care has to be taken not to let the hive become completely filled with bees. The addition of another super will generally adjust this condition. Experience has shown that frames with comb foundation are valuable at this time because the bees have immediately to get on to the task of drawing out this foundation into combs and forget about swarming.
3. Old queens.
4. A strain of bees prone to excessive swarming.
5. An excessive amount of drone brood and adult drones in the hive. This can be avoided by seeing that only sound combs with no drone cells go into the brood nest. Where adult drones are present they can be excluded from the hive by a strip of queen excluder placed in the entrance to the hive on a fine day for an hour or two. When this is removed the drones will quickly take

A hive entrance overgrown with grass, causing obstruction to the flight of bees and bad ventilation.

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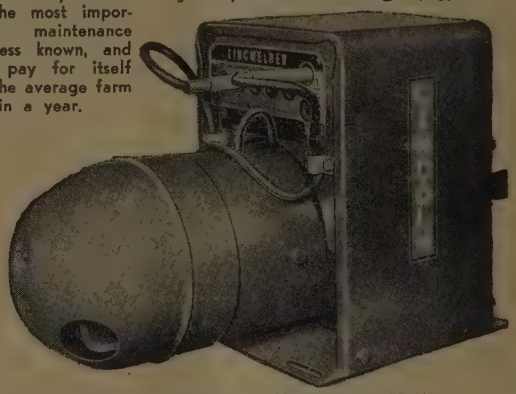

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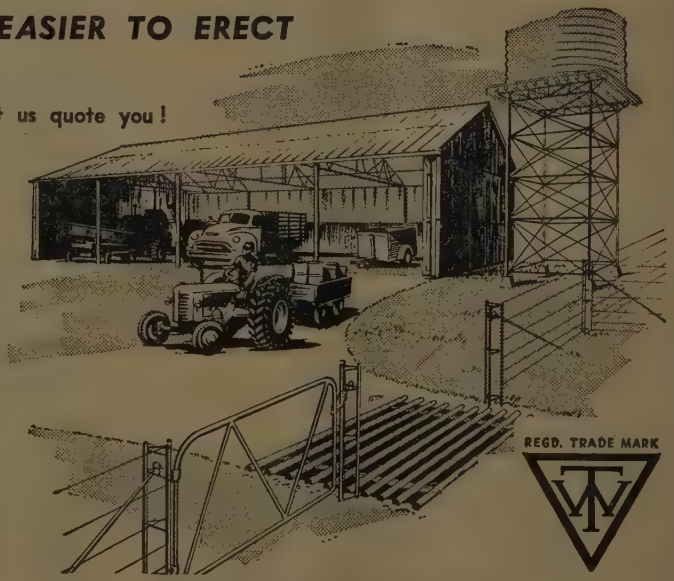

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advantage of their freedom and fly from the hive. After the rush out is over, the excluder is replaced, so preventing the drones from re-entering the hive.

6. Long spells of unsettled weather.

General Appearance of Swarm Cells

Queen cells, indicating the swarming fever in a hive, are generally found in large numbers on odd corners of the comb and very often a number are near the bottom bars of the frames. If these are destroyed, more are generally produced. It is much better to anticipate swarming by attending to the first 5 factors listed above under swarm control.

If a hive shows determined signs of swarming, the following procedure is perhaps the best:—

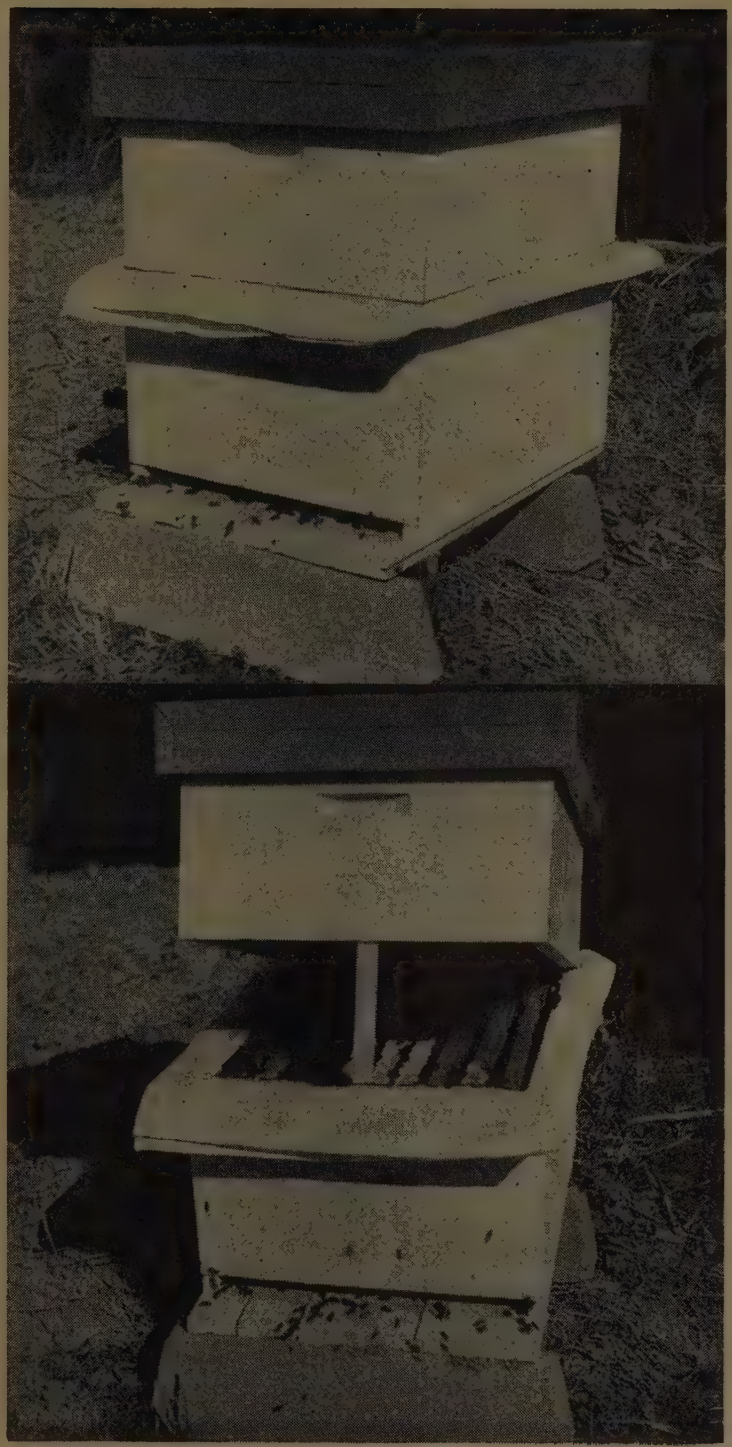
Move the hive to a new stand several feet away. Place a new hive in the old position, sort out a good comb of brood and the old queen, and place them in the centre of the new hive. Put in two frames of honey and pollen and fill the remaining space with empty combs or comb foundation. (All flying bees will return to this new hive on the old location and quickly settle down and build up.) Now go through the old hive and pick out all the queen cells except one. This should be of good size and in an easy position to find.

After a few days go through the old hive again and destroy any queen cells that may have been missed or rebuilt. Make sure the cell left on the previous inspection is not damaged. In 2 to 3 weeks a young queen should be laying and brood should be evident.

The old queen can now be destroyed and the two hives united by use of a sheet of newspaper. The sheet is placed over the top of one hive after the lid and mat have been removed and the other hive is placed on top of it. This is perhaps best done in the late evening. In a few days the hive can be re-adjusted by the brood being put in the bottom supers and honey combs placed on top.

Apiary management at this time is concentrated on the production of bees. The crop of honey harvested later on will depend largely on the ability of the beekeeper to retain this force of bees until the main honey flow begins.

UNITING HIVES BY NEWSPAPER METHOD



Hives being united by use of a sheet of newspaper placed between them. →

The newspaper sheet eaten away by the bees. →

Brassica Feed Crops in the North Island

THOUGH supplementary fodder crops are not grown to the same extent in the North Island as in the South Island, nearly a quarter of a million acres of brassica crops (swedes, turnips, chou moellier, kale, and rape) are grown annually in the North Island. The distribution and utilisation in the various land districts of these crops are discussed in this article by the Extension Division.

THE brassica genus offers a wide choice of material to the farmer wishing to grow a supplementary fodder crop. Different species have a value according to whether their production is primarily in leaf growth or in bulb growth and whether they are rapid growing and more suitable for summer feeding or slower growing and more suitable for winter feeding. They exhibit a variability in their response to soil and climate and in their growth-rate on soils of different fertility.

Within the several species there is a range of varieties or types showing differences in maturity, growth habit, yield, and keeping quality, and some have resistance to diseases attacking brassica crops.

This article is not intended to cover all these aspects of brassica crops or to deal with cultural operations associated with the successful growing of crops for different purposes. That aspect of the subject is covered in other articles appearing from time to time in the "Journal", and the local Instructor in Agriculture, with his wide experience of brassica crops in his own district, is well qualified to advise on the selection of a variety or type to meet a particular need in specific conditions and on its management to produce a crop of maximum feeding value.

▲ Swedes are the most widely grown crop in the North Island. The crop plays an important part in some districts in pasture re-establishment on deteriorated hill country.

▼ Chou moellier, the favourite crop on fertile soils. The area in this crop has expanded rapidly in the last few years.

AREAS IN ROOT AND GREEN FODDER CROPS IN NORTH ISLAND IN 1954-55

Land district	Swedes	White turnips	Yellow turnips	Rape	Kale	Chou moellier
	acres	acres	acres	acres	acres	acres
North Auckland	6,396	8,134	1,045	694	632	2,512
South Auckland	35,636	26,898	3,071	1,886	1,514	8,166
Gisborne	1,105	506	265	711	102	866
Hawke's Bay	3,020	4,998	566	8,467	2,502	24,091
Taranaki	9,086	1,899	827	285	760	4,094
Wellington	15,563	8,821	2,328	5,724	5,017	26,284

Swedes (70,000 acres) comprise the most important brassica crop in the North Island, closely followed by chou moellier (66,000 acres), the area of which has expanded very rapidly in the last few years. Of somewhat less importance are white-fleshed turnips (51,000 acres). In a relatively minor place are rape (17,000 acres), kale (10,000 acres), and yellow-fleshed turnips (8000 acres). The areas of these crops in each land district during 1954-55 are shown in the accompanying table.

North Auckland

Cropping of any kind is not extensive in the North Auckland Land District, and brassica crops are no

exception. A large proportion of the cropping is done in the development, for sheep or dairy farming, of land which has reverted to manuka, scrub, or gorse.

White-fleshed turnips are the most important brassica crop. Usually they are sown early to maintain milk production on dairy farms during the dry late summer and early autumn. They may also be sown in March, either alone or with Italian ryegrass, for winter and early-spring feed. N.Z. Green Globe and N.Z. Purple Globe are the chief varieties grown. For later sowings N.Z. York Globe is gaining in favour.

Swedes are grown less than white-fleshed turnips, as the climate is not entirely suitable for this crop. Later sowings are frequently adversely affected by the hot, dry summer and earlier sowing causes the crop to mature too quickly, bringing about wastage. N.Z. Superlative is the most widely used variety.

The area in chou moellier and kale is expanding steadily, but really good crops are not common. The main reason appears to be the poor fertility (particularly lack of nitrogen) of the soil in most instances, the areas of higher fertility being of more value for the production of paspalum pastures in summer.

Yellow-fleshed swedes are grown only to a limited extent as an alternative to swedes in localities where the latter are usually found unsatisfactory.

Rape is grown by a few sheep farmers, but there is usually adequate pasture for lamb fattening.

South Auckland

The South Auckland Land District ranks high in its acreage of brassica crops. The needs of the farmer in this district fall broadly into two classes, those of the dairy farmer, who is frequently short of feed for his herd in January and February, and those of the sheep and store cattle farmer, who finds the wintering of his stock a problem.

Nearly half the cropped area is sown to swedes, though these appear to be decreasing in favour of chou moellier. Swedes are widely grown on the large area of rolling country running from Taumarunui northward to the mouth of the Waikato River. The crop plays an important part in pasture re-establishment on deteriorated hill country. The climate is particularly suitable for this crop, which generally thrives, even on the steeper and rougher slopes, with a minimum of cultivation. Swedes are also grown extensively in the Rotorua district, but good crops on pumice land can be secured generally only after the land has been in either temporary or permanent pasture.

N.Z. Superlative, N.Z. Grandmaster, and N.Z. Crimson King are all widely grown varieties, with the first-named having preference in the King Country and similar areas and the last-named appearing to suit the pumice areas best.

White-fleshed turnips, already widely grown, appear to be increasing in favour, particularly among dairy farmers, who find the crop useful to maintain production during dry spells in summer. This crop is most in favour on soils of lower fertility and is sometimes grown after a crop of swedes preparatory to grassing down in autumn.

N.Z. Green Globe and N.Z. Purple Globe are the preferred varieties.

Chou moellier is more widely grown on soils of higher fertility as an alternative to white-fleshed turnips for summer feeding and to swedes for winter use. It has the advantage of carrying well into winter, if not required for summer use, and will recover if not too heavily grazed. This crop is frequently sown after a crop of swedes where liability to club-root disease would make a second crop of swedes a risky venture.

In the King Country, where even first-crop swedes are liable to suffer from club-root disease, a common practice is to sow 8oz. to 12oz. of chou moellier seed per acre with the swede seed. This ensures at least some winter feed should the swede crop fail and at the same time appears to give some protection to the swede bulbs.

Yellow-fleshed turnips are grown to some extent for autumn and early-winter feed, being used sometimes to follow a crop of swedes because of their relative resistance to club-root disease.

Rape is grown only to a limited extent because of its frequent failure to ripen. Much of the acreage is in the Raglan County, where it ripens more satisfactorily and where it is frequently grown after swedes to occupy the land until it is sown to pasture in autumn.

Kale is not widely grown, but where used it is in the capacity of an alternative to chou moellier.

▲ For summer milk production in low-rainfall areas the white-fleshed turnip crop is recommended.

Gisborne

Except on a few of the smaller farms on the Gisborne flats, brassica crops are not grown regularly in the Gisborne Land District. This may be explained by the generally mild winters in most localities, when pastures can be depended on to produce sufficient winter feed, and the limited area of suitable cropping land in districts where the winters are more severe. There is no doubt that in the drier summers and more severe winters brassica crops would provide a much-needed supplement to the pastures, but the variability in seasonal conditions discourages farmers

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from making regular provision for extra feed of this nature.

Most of the swedes, chou moellier, and yellow-fleshed turnips are grown in Waikohu County, where extra winter feed is of primary importance. Cook County, where summer and autumn feeding is more important, produces most of the white-fleshed turnip crops. Some chou moellier and kale, which may be used for fattening lambs and then left for a reserve of winter feed, are also grown in Cook County.

Rape is being less widely grown for lamb fattening because of its susceptibility to insect infestation.

Hawke's Bay

The practices associated with brassica crop production in Hawke's Bay fall into three main groups. In the area to the north of Napier, where many of the ploughable soils consist of fine pumice ash, white-fleshed turnips are rapidly replacing rape and chou moellier as a summer crop for both lamb fattening and milk production. Rape has proved unreliable because of the frequent wet summers and chou moellier is difficult to establish early enough for summer feeding. For turnips for lamb fattening it is becoming the practice to use heavier seeding rates to promote a greater growth of tops rather than bulbs.

Swedes are grown in this area for winter feed, with some chou moellier on the heavier river flats. Neither turnips nor swedes do well as a first crop in the breaking in of new country, but both thrive better after a crop of grass.

Of the area extending southward from Napier to include the Takapau Plains a large portion has a relatively low rainfall and high summer temperatures. Chou moellier is widely grown in this area and its use has been expanding rapidly. Not only is it grown for winter feed for cattle and sheep, but it is replacing much of the rape formerly grown for lamb fattening. In this area chou moellier is a much safer crop, and if not fully required in summer, can be left for a winter reserve. Medium-stemmed chou moellier is favoured for sheep feeding.

Good rape is the best lamb-fattening crop, but it is a risky one because of the frequent very hot and dry summers, when drought and aphids take a heavy toll. The acreage in rape is declining each year as more chou moellier is grown for lamb fattening and as pastures are improved.

White-fleshed turnips are used mainly as a catch crop on the lighter pumice and shingly soils. A common practice is to sow turnips with grass in autumn. For this purpose N.Z. York Globe is preferred, because of its quick maturity and its sparse top growth, which has a minimum smother effect on the young grass.

Rape is still the best lamb-fattening feed in drier districts, such as Central Hawke's Bay.

Swedes are grown mainly in the course of pasture improvement in the back country, and most of the crop is sown with chou moellier as a mixed crop. The shade of the chou moellier leaves appears to provide a check to aphid attack on the swedes. The varieties N.Z. Wilhelmsburger and N.Z. Superlative are favoured on the heavier soils, the former doing best on heavy land overlying clay. N.Z. Sensation does best on the lighter, free-draining land.

Kale and yellow-fleshed turnips are grown only to a limited extent, the former as an alternative to chou moellier.

In the southern part of Hawke's Bay there is less dependence on brassica crops, particularly for summer feeding, because of the higher and more evenly distributed rainfall. Nevertheless, winter conditions can be severe over most of this area and many farmers find it profitable to have a good winter feed crop on hand.

Chou moellier is the most widely grown crop in this area and is commonly used for winter feeding in both dairying and lamb-fattening districts.

Swedes are grown for winter sheep feed, but almost invariably some chou moellier seed is included in the sowing. With the improvement of pastures through resowing and topdressing, rape is now seldom grown.

Taranaki

In the early development of farming in Taranaki swedes and turnips played an important role. Since then farming has been carried out mainly on established pasture, but recently there has been an increase in the breaking up of old grass for cropping and pasture renewal with improved herbage strains. In this cycle brassica crops have regained some of their earlier prominence.

Swedes for winter feeding are the main brassica crop on both sheep and dairy farms. The common varieties—N.Z. Superlative, N.Z. Grandmaster, and N.Z. Crimson King—all do well, and N.Z. Calder is also being used quite extensively. Often a mixture of varieties is sown, but a better practice is to keep the varieties in separate blocks and feed them in order of maturity.

Chou moellier is also fairly widely grown and is generally sown as a second crop after swedes. It is not so popular as a summer crop in this district, as earlier sowings may fail

to germinate if the weather is cold and wet.

White-fleshed turnips are preferred for early-autumn feeding. They are not grown as extensively as they might be, chiefly because it is only in the dry season that their need is really felt. N.Z. Green Globe is the most common variety, with N.Z. Purple Globe also popular. N.Z. York Globe is used for late sowings where earlier sowings of other brassicas have failed.

Yellow-fleshed turnips and kale are grown to a limited extent as alternatives to swedes and chou moellier respectively. Very little rape is grown in Taranaki.

Wellington

The area of brassica crops in the Wellington Land District, already large, is expanding with the increased acreage being broken up for pasture improvement. This applies both on the hill country and on the lowlands. Crops are grown mainly for winter feed, but in districts such as the sandy belt of the west coast and parts of the Wairarapa, where rainfall is low and soils are free draining, the provision of summer feed is also important.

Chou moellier is by far the most popular brassica crop in this district. It is grown on both sheep and dairy farms, chiefly for winter feed, though where earlier spring sowings can be made it is also used in summer for dairy cows and for lamb fattening. On the better hill country it is often grown either alone or with swedes, but on the poorer hill country swedes are more reliable. The medium-stemmed variety is preferred because of its finer stems and higher proportion of leaf.

Swedes rank next in importance to chou moellier and are preferred in districts having a colder climate and poorer soils. N.Z. Superlative is the variety favoured on the heavier lowland soils, with N.Z. Grandmaster and N.Z. Crimson King preferred in colder inland districts where the crop is required for feeding later in winter. When seed of the new swede variety N.Z. Wye becomes more readily available it will gain in popularity because of its resistance to club root.

White-fleshed turnips are also being grown more extensively, mainly for summer milk production on dairy farms in the drier areas, but also for lamb fattening on some of the poorer and lighter soils. N.Z. Green Globe is the main variety grown, with N.Z. Purple Globe and N.Z. Red Globe for the earlier-fed breaks. N.Z. York Globe is coming into favour for sowing as a catch crop after cereals or when other brassica sowings have failed.

Most of the rape grown in the Wellington district is in the drier areas of the Wairarapa, where the crop ripens better for lamb feed. For this purpose the Broad Leaf Essex variety is preferred, though Giant rape is used in some localities as a catch crop for summer feeding to dairy cows.

Kale is grown for lamb fattening and for winter feed on sheep farms. It stands dry conditions better than chou moellier and though not as heavy a cropper, recovers well after feeding off in late summer.

Yellow-fleshed turnips are grown occasionally as an alternative to swedes.

Meteorological Records for August

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in Inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	52.8	+ 1.8	66.3	31.4	9.91	23	+ 3.08	2.51	2	160
Auckland	160	53.4	+ 1.2	66.0	37.4	8.94	20	+ 4.52	2.30	3	175
Tauranga	10	50.6	+ 0.9	62.6	31.1	6.53	19	+ 1.78	1.57	3	162
Ruakura	131	49.0	+ 1.2	62.8	29.4	6.92	20	+ 2.83	1.50	3	150
Rotorua	975	47.4	+ 0.4	62.6	28.2	5.48	17	+ 0.58	1.83	3	135
Gisborne	12	50.0	+ 0.8	65.3	29.2	5.58	16	+ 1.72	2.41	3	130
New Plymouth	160	50.6	+ 1.0	60.4	36.0	7.51	17	+ 1.76	1.54	1	162
Karioi	2125	42.1	+ 0.1	58.0	24.8	4.53	14	+ 0.32	0.77	28	
Napier	5	49.8	+ 0.7	67.2	32.2	2.16	12	− 0.77	1.11	3	162
Wanganui	72	49.2	+ 0.1	63.1	30.9	3.10	16	+ 0.15	0.97	11	163
Palmerston North	110	47.8	+ 0.1	62.0	29.4	3.61	19	− 0.14	1.23	11	130
Waingawa	340	46.2	+ 0.3	63.0	27.0	1.86	17	− 2.32	0.28	26	142
Wellington	415	48.1	+ 0.5	59.9	36.3	3.76	17	− 0.87	1.27	11	155
Nelson airfield	5	44.4	− 0.4	59.0	26.3	1.60	14	− 1.54	0.37	23	181
Blenheim	12	46.3	+ 0.0	65.0	28.1	0.78	10	− 1.55	0.17	7	201
Hokitika	15	45.6	+ 0.9	59.5	29.0	5.36	15	− 3.68	0.96	13	156
Hanmer	1270	41.8	+ 0.4	63.0	25.0	2.22	16	− 1.36	0.56	25	134
Christchurch	22	44.4	+ 0.1	70.8	25.7	1.23	11	− 0.82	0.24	3	156
Ashburton	323	44.2	+ 0.5	65.0	25.0	1.76	10	− 0.56	0.84	11	158
Timaru	56	44.0	+ 0.2	63.1	25.4	1.05	5	− 0.41	0.41	11	155
Alexandra	520	41.8	+ 0.4	63.3	24.9	0.45	7	− 0.18	0.15	26	164
Taieri	80	43.3	− 0.4	64.8	23.8	1.18	10	− 0.56	0.49	11	147
Invercargill airfield	0	43.0	+ 0.0	63.1	25.8	2.10	14	− 0.84	0.43	10	150
Chatham Islands	140	46.4	+ 0.2	57.0	31.1	3.08	27	− 0.14	0.38	12	

Soil Science Conference

THE second conference of the New Zealand Society of Soil Science will follow the conference of the New Zealand Grassland Association at Canterbury Agricultural College in November. There will be two days of papers and discussions and an excursion to illustrate in the field as many as possible of the points made in the papers. Proceedings similar to those of the first conference in 1954 will be published early next year.

The society was formed in 1952 and now has over 200 members. The conference brings together soil scientists, agriculturists, foresters, and scientists from the universities and from industry, and gives them a chance to discuss recent developments.

The conference is being organised by Professor T. W. Walker of Canterbury Agricultural College. The programme is as follows:—

November 29: "Soil Science in the Soviet Union", N. H. Taylor. "An Assessment of Ammonium Fluoride as a Fractionating Agent for Inorganic Phosphate", C. V. Fife. "Some Aspects of Molybdenum", H. O. Askew. Symposium on soils and pasture production in Canterbury: "The Soils of Canterbury" (W. T. Ward), "The Role of Sulphur in Pasture Production in Canterbury" (A. F. R. Adams), "Conservation of the Soil" (R. D. Dick), and "The Assessment of Available Potassium in Soil" (D. E. Hogg). Evening: General meeting, presidential address by R. E. R. Grimmett: "The Challenge to Soil Science".

November 30: Symposium on pedological problems in the South Island: "Some Pedological Aspects of Forest Soils of the South Island" (E. J. B. Cutler), "Second Thoughts on Soils of the High Country" (J. D. Raeside), and "The Classification of Peats and Peaty Soils" (W. F. Harris). Symposium on soil moisture: "The Effect of Seasonal Moisture Deficiency on the Yellow-grey Earths" (I. J. Pohlen), "The Calculation of Soil Moisture Deficit and its Application to Irrigation Requirements" (D. S. Rickard), "Effect of Soil Moisture on Transpiration Rates from Plants" (R. L. Closs), "Influence of Wheel and Foot Treading on Grasslands" (K. F. O'Connor), and "Effects of Animal Treading on a Wet Alluvial Soil under Pasture" (M. Gradwell). Evening: Slides of the tussock country (L. W. McCaskill).

December 1: Field trip, a cross-section of Canterbury—Lincoln to Broken River.

Work in the Home Garden

Well-planned gardens in favourable situations show to advantage in November.

BY November conditions in most vegetable production areas in New Zealand are favourable for the growth of frost-tender crops such as cucumbers, pumpkins, squash, marrows, tomatoes, and sweet corn, and successional sowings should be made of most hardy vegetables. Late autumn, winter, and early spring crops are just as important as summer ones, and in most districts seed of plants such as savoy cabbage, winter cauliflower or broccoli, fine-leaved kale, leeks, and parsnips should be sown, or preferably seedling plants should be established early in November ready for setting out in December or January or, at the latest in all except the mildest districts, in early February. In this article A. G. Kennelly, Horticultural Instructor, Department of Agriculture, Dunedin, discusses some of the work in the home garden in November.

EXCEPT in a few southern districts early in the month, the risk of frost damage is past by November and the ground has warmed enough for good growth of half-hardy plants such as dwarf and runner beans, cucumbers, marrows, pumpkins, and squash, New Zealand spinach, sweet corn, and tomatoes, and in many districts for plants such as melons and kumaras, which need even warmer conditions. Successional or main-crop sowings can be made of root crops such as beetroot, carrots, celeriac, kohl rabi, parsnips, salsify, scorzonera, and turnips. Potatoes can still be planted and successional and preferably small sowings can be made of crops such as lettuce, mustard and cress, radishes, and spring onions for salad use.

Successional sowings of peas can be made where soil conditions are not likely to become excessively dry, and where conditions are favourable celery plants, particularly the self-blanching kind, can be set out.

Crop rotation should be practised and crops should be kept weed free. Thinning should be done as soon as seedlings are large enough to be handled conveniently, so that the remaining plants are not disturbed too much.

Plants, particularly those grown for their vegetative or leafy qualities, that tend to slow in growth owing to the exhaustion of some plant nutrients in the soil may be stimulated by a top-dressing of nitrogenous fertiliser. Sulphate of ammonia or nitrate of soda are suitable, though where conditions tend to be dry, regular applications of liquid manure may be more effective. This can be made by dissolving sulphate of ammonia or nitrate of soda in water, at about 2oz. to the gallon, or by suspending a partly filled sugar bag or sack of animal manure in a large container of water and using the liquid.

Asparagus

In harvesting asparagus shoots care should be taken not to exhaust the crowns. Too heavy cutting will reduce subsequent yields and many beds have been ruined in this way. The usual method of harvesting is to cut the shoots or spears a little below the ground surface with a sharp knife or special cutter which has a double V shaped or chisel point.

It is safe to cut half as deep as the top of the crown is below the ground; if the crown is about 4in. to 5in. down, the spears are cut about half that depth below the surface. The cutting usually begins when the spears are

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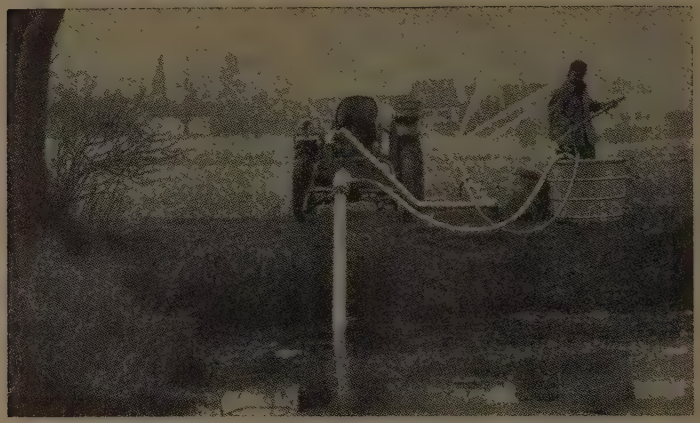

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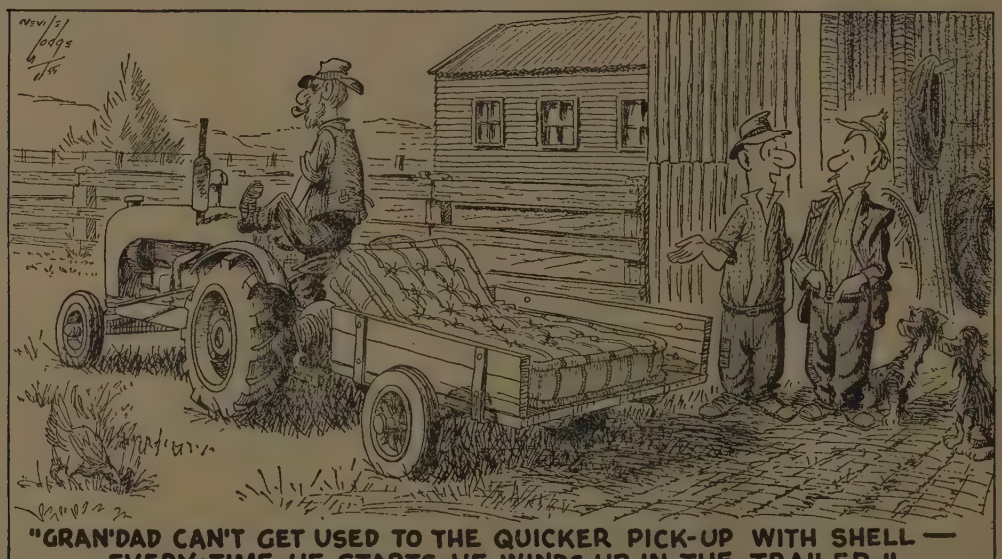

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6in. to 8in. above the ground. The spear is first gently pulled so that its position can be determined and if the operator is experienced, it can be cut with a single thrust without causing damage to other spears. In loose soil spears can be broken off by bending them with the hand, but this method may cause the spear to break too deeply and damage the crown. The butts of spears are usually fibrous and should be trimmed off before use, though the pieces can be used for flavouring soup.

Beans

Climbing beans can be grown in rows without staking by slashing or pinching back excessively long growths, but where growing conditions are favourable, best results are obtained if beans are staked or allowed to climb a support.

For supporting runner beans a double row of arched 8ft. stakes is satisfactory or they can be supported by wires (in a fence system) with strings or pea sticks running vertically from the wires. A third method is to use groups of 3 or 4 stakes of 8ft. or longer placed firmly in the ground 18in. to 24in. apart and inclining toward each other so that they can be tied at a point near the top.

Red mites or red spiders commonly attack beans. The adult mites are very small, from 1/15in. to 1/25in. long. They are difficult to see with the unaided eye, particularly early in the season, when they are usually greenish, though they may be pale yellowish or cream with a large green spot on each side of the body. Later in autumn they usually turn red. They spin fine webs on the undersides of the leaves, which they rasp, denuding them of green matter so that the leaves take on a silvered appearance.

An important aspect of the control of red mite is to destroy weeds on which the mites feed and multiply and are carried over from one crop to another. Red spiders can be controlled by summer oil sprayed at 1/3 pint to 4 gallons of water or lime sulphur at ¼ pint to 4 gallons of water. or chlorobenzide wettable powder preparations used according to the manufacturer's recommendations. TEPP or HETP sprays will also control red spider, but must be used carefully on beans, as they may cause plant damage.

Carrots

A successional sowing of carrots can be made in November, or the main crop can be sown. Carrots are useful for winter and where there is enough moisture in the ground later sowings are usually satisfactory. Dry conditions check growth, and affected plants quickly succumb if aphids attack them. Comparatively late sowings are usually best for the production of good roots in late autumn, as roots from early sowings have by that time usually become rather coarse.

[*Green and Hahn*

Self-blanching celery can be set out in November in warm situations; elsewhere it is better to defer planting until December, as the seedlings are sensitive to prolonged exposure to comparatively low temperature.

A close watch should be kept for aphid attack. Carrot aphids are small, globular, and green or yellowish green and may be wingless or have four transparent wings. They suck the sap and stunt growth and affected young plants may wilt in hot weather. The tiny white specks present are the cast skins of the aphids and are sometimes the most readily noticed signs of their presence. The foliage may change to a bronze, bluish, or reddish hue and the leaves and leaf stalks become distorted. Aphids can be controlled by spraying with nicotine sulphate or HETP or TEPP.

Carrot rust fly is also likely to be troublesome in some districts. The adult is a shining black fly about 1/3in. long. It has a yellowish head, yellow legs, and one pair of wings and lays its eggs near the crown of the carrot. The larvae or maggots are slender, creamy white, rather rigid, legless, and up to ¼in. long; they are broad at one end and taper off to a slender head. After hatching, the larvae burrow down and attack near the tip of the taproot, leaving rusty brown tunnels which at first are only near the surface of the carrot. Young carrots may wilt or die. Control consists mainly of treating the seed with lindane and later by regular spraying with lindane. Spraying nearby hedges with DDT is also of some value.

Celery

Where conditions are warm enough self-blanching celery can be set out during November in beds or trenches in soil that has been heavily manured. Beds are usually made 4 to 6 rows wide with the plants set out 10in. to 12in. apart each way. In trenches a double row 9in. to 12in. apart with the same spacing between the plants is satisfactory. The trench can be any depth up to 12in.

Blanching of double rows can be done by drawing the soil high against the ribs, care being taken not to allow any to get into the centres of the plants, or by wrapping individual plants with stout paper. Beds containing multiple rows are best blanched by placing a length of 12in. x 1in. timber along the outside edges of the bed. Blanching should not be begun until the plants are about 3 weeks from maturity, as otherwise their development will be arrested.

Poultry or farmyard manure is a very suitable manure, but where this is unobtainable or in short supply a mixture of 4 parts of blood and bone, 2 parts of superphosphate, and 1 part of potash by weight can be broadcast

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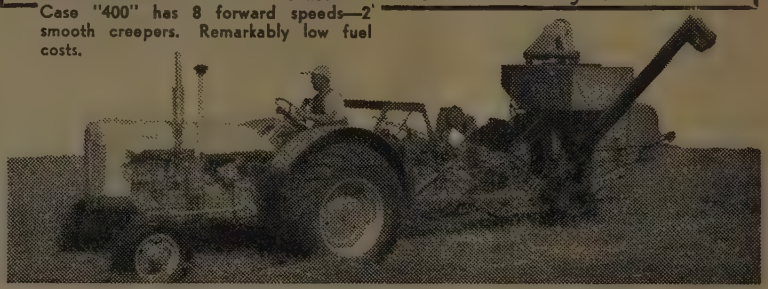

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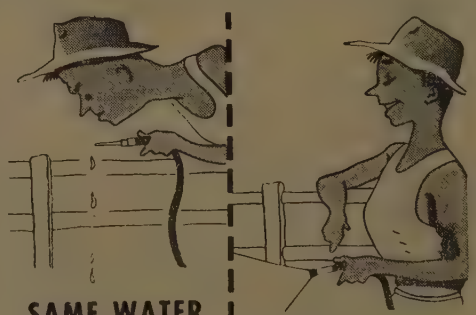

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over the area at ¼lb. to a square yard and worked into the soil after digging.

Celery should be kept weed free, and where conditions are humid enough for leaf spot to be troublesome it should be sprayed with a suitable Government-certified fungicide at 10- to 14-day intervals. Where aphids are present nicotine sulphate at 1 fl. oz. to 5 gallons of water should be applied. Celery should not be planted in a part of the garden recently occupied by a carrot crop which has been affected by the carrot rust fly, as the pest is also liable to attack celery.

Celeriac

Celeriac or turnip-rooted celery is a good substitute for celery and takes less time and much less trouble to grow. It has a turnip-like root with a characteristic celery flavour. The roots mainly are used; they may be boiled, used in stews, or sliced and eaten raw as a substitute for celery in salads. Even the leaf stalk can be used when it has developed well.

Plants may be set out now, but as celeriac is not as well known as celery, few seedsmen sell plants, though most sell seed. Because it is very hardy, does not require to be blanched, and succeeds on a wide range of rich, moist, well-drained soils, celeriac deserves to be more extensively grown by home gardeners who have a liking for the flavour of celery. Seed is usually sown ¼in. to ½in. deep in rows 15in. apart when the ground has warmed in late September or October, though a sowing can be made now where conditions are favourable. Plants sown earlier can now be thinned to or set out 6in. to 8in. apart in rows 18in. apart.

Plants should not be set out deeply and should be liberally watered in dry weather. In very dry situations plants should be set out in shallow trenches to facilitate watering. Plants should be set out in a rich soil so that they make vigorous, continuous growth. During cultivation side shoots should be removed and the soil dragged away from the bulbous roots, which should be kept trimmed of all suckers, as they tend to detract from shapely development of the roots.

In districts which experience repeated severe frosts the roots can be lightly earthed up in autumn for protection, but lifting and storing are unnecessary except in heavy, poorly drained soil in exposed situations. Varieties include Celeriac and Giant Smooth Prague.

Kohl Rabi

Kohl rabi is not commonly grown in home gardens in New Zealand, though it deserves to be, as it is more tolerant of dry conditions than are turnips. It belongs to the cabbage family and many people consider that its flavour is superior to that of cabbage, as it combines the flavours of both cabbage and turnips. It is usually treated as a root vegetable, though it is not a root vegetable in the sense that carrots and turnips are, as its bulbous edible "root" is an enlarged stem which forms above the ground.

[Green and Hahn

Kohl rabi should be harvested before it is fully grown. Seed can be sown in most districts now.

To secure tender, succulent bulbs kohl rabi should be grown quickly. It should not be allowed to grow beyond about 3in. in diameter, because if left to reach maturity, it becomes tough and stringy. It grows well in a soil that is well drained and reasonably rich in humus. Though kohl rabi is often classed with turnips, it does well under a wider variety of conditions; generally its requirements are more similar to those of summer and autumn cabbage.

Kohl rabi is usually grown as a cool-weather vegetable, but is very useful as a substitute for turnips during hot, dry weather, when turnips are likely to fail, though even kohl rabi should not be permitted to become too dry or it may have a bitter flavour. Because of kohl rabi's superiority over turnips in withstanding dry conditions November to January sowings of kohl rabi are often favoured. It is very hardy and late summer sowings may be pulled as required until late spring. The bulbs do not keep well in store.

Seedlings transplant well, but it is usually preferable to sow the seed ½in. deep in rows 12in. to 15in. apart and later thin the plants to stand 6in. to 8in. apart in the rows rather than to transplant them. Plants mature in from 8 to 12 weeks from sowing.

Good varieties include White Vienna, Purple Vienna, and Short Top Green.

Lettuce

Where a succession of lettuce is desired a November sowing is best made in the situation where the crop is to mature. Though lettuces can be transplanted readily, the plants' ability to withstand transplanting depends on several factors. Roots damaged and destroyed during transplanting are normally replaced quickly by new growth, but this depends on the ability of the roots to absorb water readily, and the relative ability to absorb water depends in turn on the amount of suberin or corky covering on the roots; the thicker or more distinct the covering is the slower the absorption will be. Other factors such as the reserve of food in the plant are, however, also likely to be important. In November, when conditions are often dry, the check of transplanting, even if the work is done with the greatest care, is likely to be severe. Sowing in the place where the plants are to mature is therefore preferable.

Lettuce thrives in cool, moist, well-drained soils, but unless grown quickly it tends to be tough and bitter. Seed should be sown thinly ¼in. deep in rows 12in. apart. The soil should be cultivated to a very fine tilth and it should be rich in organic matter.

Good varieties for districts where conditions are hot include Great Lakes and Imperial 456. Where summer heat

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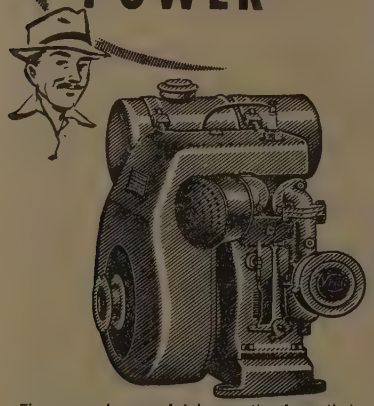

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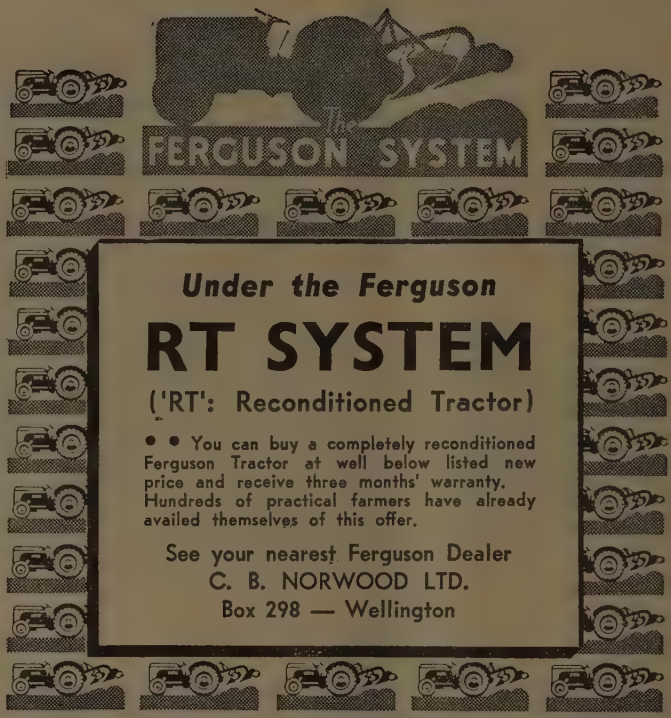

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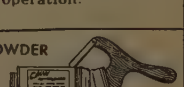

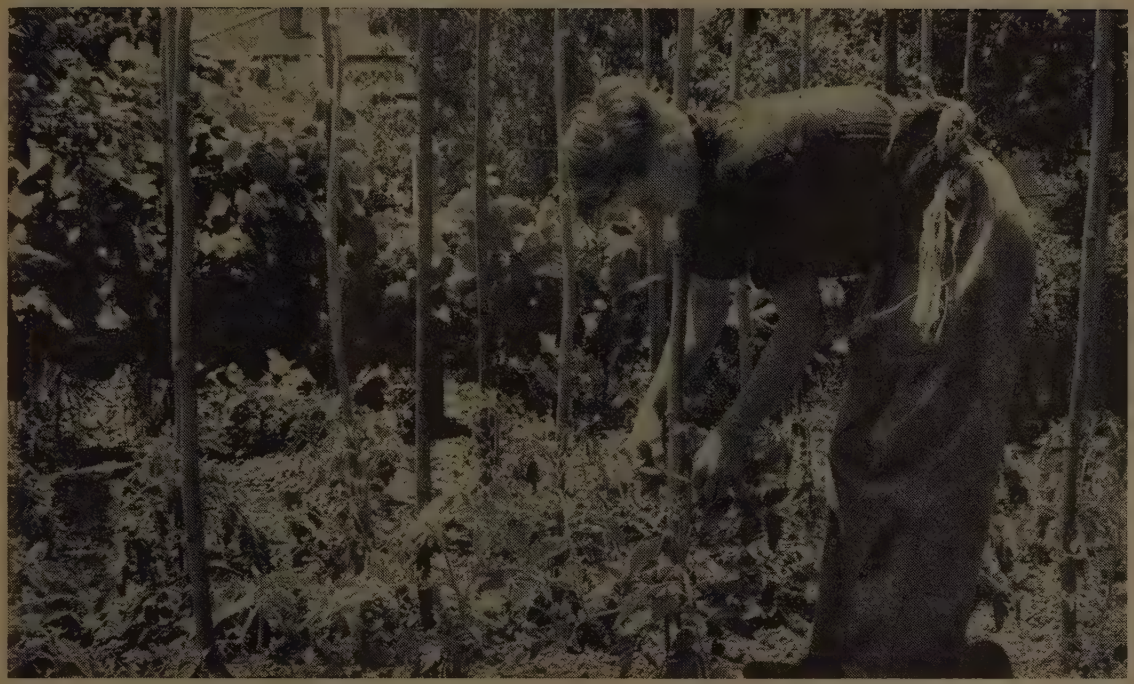

[*Sparrow*

Tomato plants should be well established in most districts by the middle of November.

is more moderate almost any of the popular summer varieties, for example, Neapolitan (New York, Webb's Wonderful) or Success, are likely to give a satisfactory crop.

Onions

Onion plants should be kept weed free, as the onion suffers seriously from weed competition, which not only reduces the available supply of moisture and plant food for it, but provides conditions conducive to the development of some fungous diseases and for the increase of insect pests.

Thrips are often troublesome on onions when the weather becomes warmer. Thrips are about 1/20in. long and yellowish brown to black, the light coloured being the nymphs or young and the dark ones with fringed wings the adults. Thrips damage the leaf surfaces by rasping them and denuding them of chlorophyll, which is essential for the development of the plant. Affected leaves usually have a silvered appearance or silvered or corky areas.

Thrips can be controlled by nicotine sulphate as advised for carrots, but it should be applied on a hot, still day to be most effective, as the adult thrips tend to fly clear of the plants when disturbed and part of the effectiveness of nicotine is its action as an asphyxiant. HETP or TEPP are generally more effective as contact insecticides and, used with DDD or DDT, which have a residual effect, they are particularly effective.

Parsnips

Though October is the preferred month in southern districts for sowing parsnips, November or December or even later sowings are usually satisfactory in districts which have a long season of growth. Parsnips are high yielding and when well established in moderately rich, well-drained soil need little attention. Probably their greatest value lies in their use as a winter vegetable, as in well-drained soil they remain in good condition for a very long period.

Like most other succulent, taprooted vegetables, parsnips should be kept growing steadily if they are to be of good quality and yield well. A deep, friable, well-drained, deeply cultivated soil well supplied with humus is preferable. Parsnips do best in soil to which organic manure has been applied to the preceding crop, though satisfactory results can be obtained if manure is applied in moderation and is well rotted and thoroughly incorporated in the soil before sowing. Where organic manure is not available compost or a green crop should be dug in and supplemented with a fertiliser rich in nitrogen, phosphorus, and potash. Local experience must determine the actual ratio, but a complete fertiliser high in phosphorus and relatively low in nitrogen is likely to be most suitable.

For the production of long, straight roots the ground must be dug to a depth of 2ft. or more unless it is very loose and open. This entails too much work for the average home gardener and the method sometimes adopted is to make holes with a crowbar 9in. to 12in. apart and fill them with fine, suitably prepared soil (potting soil is suitable). After the soil is firmed 4 or 5 seeds are sown in each hole, as germination of parsnip seed is usually poor. Only the strongest seedling from each hole is left after seed has germinated.

Potatoes

While the potato crop is growing it should be kept weed free and the soil from the sides of the rows moulded into as sharp ridges as possible.

Though moulding is not essential for tuber development, it prevents the spores of late blight on the foliage from washing through the soil and coming in contact with the tubers underneath. Tubers should be kept

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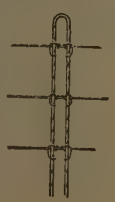

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covered with sufficient depth of soil to prevent attack by the potato tuber moth.

Well-spaced rows make available more soil for covering the tubers and this is important, as complete coverage is essential to prevent direct attack by the potato tuber moth. The first ridging should be delayed until the foliage is well developed so that the moisture content of the soil is retained as long as possible. Spraying with DDT is effective in controlling tuber moth attacks. In districts where potato blight is often troublesome the plants should be sprayed regularly with bordeaux mixture or a suitable Government-certified substitute as foliage develops.

Salsify or Vegetable Oyster

The flavour of salsify suggests the flavour of the oyster. It is a biennial and may be regarded as an alternative to the parsnip, from which, however, it differs entirely in flavour, though its culture is similar.

Salsify is usually sown from August to January and matures more quickly than most varieties of parsnip. It grows to about 2in. in diameter at the crown and from 7in. to 10in. long, but may be used any time after it is half grown. A deep, rich, well-drained soil that has not recently been manured is best. It should be well cultivated and seed should be sown ½in. deep in rows 15in. apart and the plants thinned to 4in. apart in the rows. The variety recommended is Sandwich Island.

If a few roots are left at the end of winter, they can be covered with upended flower pots, over which leaf mould or fermenting manure can be placed. This will blanch the flowering shoots, which should be cut and used after the manner of asparagus, but when not more than 5in. long.

Scorzonera or Black Salsify

Scorzonera or black salsify is a hardy perennial the culture and use of which are similar to those of salsify. It is sweet and agreeable and it is generally preferred to salsify, which it resembles in shape. Salsify, however, is cream coloured, whereas scorzonera is black or purplish black. The leaves of scorzonera are broader than those of salsify, which are almost like grass. The leaves of scorzonera may be used in salads and the roots can be left in the ground for several years. Scorzonera matures in about 18 weeks.

New Zealand Spinach

New Zealand spinach, which is a half-hardy, trailing annual with large, succulent leaves, can still be sown. It is not a true spinach, but is valuable for use in hot, dry, sunny situations and is often preferred because it lacks the peculiar bitterness of true spinach. Growth of New Zealand spinach is rapid at this time of year in most soils, but it responds best to a light, fertile soil in a sunny position with adequate moisture.

New Zealand spinach is harvested by pinching off about 3in. of the growing tips, which forces new shoots to develop, so that when established the plant has a multitude of tips for gathering. It grows quite large and plants should be given a spacing of at least 2ft. each way.

Seed, which is usually rather slow to germinate, should be sown 1in. to 1½in. deep not more than a week before frost danger is past. Two or three seeds should be sown together at each spacing and the weaker seedlings removed after establishment.

[Green and Hahn

The plant commonly known as a yam in home gardens in New Zealand grows well in warm situations on well-drained, rich soil, but is not related to the yam of the tropics.

Winter Vegetables

Brussels sprouts, kale (borecole), savoy cabbage, and broccoli deserve more attention than they receive in most home gardens. They are high yielding and after establishment require comparatively little attention. The soil should be prepared some time before planting by the thorough incorporation of well-rotted organic manure. Fairly heavy loams that are well drained and suitably enriched are usually preferable.

Only a few home gardeners sow seed; most purchase plants which are available from most seedsmen for setting out in December, January, or early February. Seed can still be sown, preferably in most districts not later than early in November, though in districts having a long, mild autumn later sowing is satisfactory.

It is rather late for sowing leek seed, but plants are available from most seedsmen.

Yams

The true yam is a tropical plant with an edible root, but the yam usually grown in New Zealand belongs to the same family as the shamrock, the foliage of which is somewhat similar. It is grown for the tubers, which are long and ovoid and are marked with numerous regular hollows. They have a smooth skin which may be yellow, white, or red. The end which joins the stem is usually slightly narrowed.

The plant, which has a spreading habit, grows well in warm situations in well-drained, rich soils that preferably are light. The yam is a perennial, but as it is frost tender, it is usually grown after the manner of potatoes. It is propagated by sets like the potato, but can be grown from cuttings, which are easily rooted.

The sets should be planted 3in. deep and 18in. apart in rows 2ft. apart as early as possible, but the time of planting should be arranged so that there will be no danger of frost damage to the foliage. In districts where the plant grows particularly well spacing should be more liberal.

As the stems lengthen they should be covered to within 6in. to 8in. of the tops with light soil or compost, as this assists the development of tubers. The tubers, which are produced in great abundance, are rarely thicker than a hen's egg. They do not swell much until fairly late in the season, and in most districts it is not customary to gather them until frost has cut down the foliage. The tubers of some strains have a somewhat acid taste when first dug, but quickly lose this acidity on exposure to the sun.

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Trees on the Farm

Controlling Forest Fires

THE arch-enemy of trees is fire. Though the farmer with trees surrounded by clean pasture has little to fear from this menace, to many others fire is a perpetual worry. These notes by W. H. Jolliffe, Extension Forestry Officer, New Zealand Forest Service, give some facts about fires and outline control measures.

FORESTS and woodlots in New Zealand do not ignite spontaneously; nor are they set on fire by lightning, which here is almost always accompanied by rain. Though malicious firing is fortunately extremely rare, there is always the human factor behind conflagrations. Carelessness by smokers, especially those travelling along roads, omission to extinguish billy fires, sparks from engines and sooty exhausts of tractors, and the escape of a nearby scrub or tussock fire are the most frequent causes of damaging fires.

Conditions favouring the ready spread of fire vary from day to day and even throughout any one day. Factors influencing these conditions are the dryness of the inflammable material whether it be peat, grass, bracken, scrub, or dead litter; the atmospheric humidity, which is of course related to temperature; and the force and direction of the wind. Up-to-the-minute knowledge of the interaction of these fundamental factors is so important to the safety of certain forest areas that readings are made at least thrice daily during the fire season and result in the broadcast warnings heard so often over the radio.

Under extreme conditions a fire may become "explosive" in the rapidity with which it spreads. At such times almost anything will burn and furthermore fuels like peat and long-dead stumps and standing snags will retain some fire even after a considerable drenching by rain or applied water. On the recurrence of suitable conditions these "hot spots" will develop and may again cause trouble.

Rural Fire Organisation

Fire out of control in rural areas can cause so much damage that the problem has been tackled on a national basis by the enactment of the Forest and Rural Fires Act 1955. Under this Act all county councils are made fire authorities, having jurisdiction over all lands not included in State areas, in soil conservation districts, or in rural fire districts. The last-named are created to give more active protection to areas of forest and flax, to sand dune areas, and to peat and gum lands, all of which are, of course, particularly vulnerable to fire.

[*National Publicity*

Damping down a fire along the edge of a track by use of a knapsack pump and spray attachment.

Fire authorities are empowered to carry out measures for the prevention, detection, control, and suppression of fires in their districts. They are required to appoint Fire Officers, who have fairly wide statutory powers including the issue of permits to light fires in the open during closed fire seasons. The closed season generally extends from 1 October to 30 April, but the dates may be altered in accordance with local hazards.

During a fire season it is unlawful to light a fire in the open without a permit from a Fire Officer. However, the holder of a permit must not exercise his right to set fire if conditions have become dangerous or if a broadcast or other warning has been made affecting his locality. The holding of a permit does not relieve a person lighting a fire from liability for actionable damage sustained by another person as a result of the fire.

The Forest and Rural Fires Act also imposes on anyone who finds a fire burning unattended in the open in or within a mile of a State area at any time or in any other district during a closed season a duty to try to extinguish it or else to notify the nearest Fire Officer of its whereabouts.

Most forest and rural fires start in a small way and can be easily extinguished at the outset. It is therefore important in fire fighting to get on the scene as quickly as possible.

Water is the most effective weapon, and is best applied as a spray, in which form a little water can damp down a lot of fire.

The most useful tools to keep always handy are shovels, slashers, knapsack pumps, and grubbers, the number of each depending on the size of the area to be protected and on the number of people likely to be able to assist. Other tools which may be useful are beaters (sacks, for instance) for grass fires, rakes for fires running in dry pine needles, and axes for felling woody growth too big for the slashers.

Some points to remember are:—

Constant effort until it is out is the best way to combat fire. Steady use of hand tools may be more effective than the intermittent use of water.

Work from a safe flank, if possible, and try to encircle the fire.

Watch for "spot fires" caused by lighted fragments falling on to unburnt material behind the defended line.

Be sure of a way of retreat in case of wind change.

The fire is not out until all parts can be tested by hand and even then it should be watched.

DALAPON

GRASSES present many weed problems in New Zealand. Shortly there will be freely available commercially a grass-killing chemical called dalapon. It is the first selective grass-killing chemical to be commercialised that has similar powers of moving from foliage to roots as happens with hormone weedkillers. Dalapon is most effective when applied to the foliage of actively growing grasses. Applications should be made preferably when there is a likelihood of one or two days of fine weather after an application, as rain will wash the chemical from grass foliage into the soil.

As early as 1954 the Extension Division of the Department of Agriculture obtained experimental supplies of dalapon. To date 40 trials have been laid down on lucerne, brassicas, and on a wide range of grass weeds. It has also been used as an aid to oversowing, checking growth on railway and road verges, and controlling grass weeds in ditches and irrigation races.

LUCERNE Excellent control of browntop and *Poa annua* has been obtained in lucerne with dalapon at rates up to 10lb. per acre. The time of application is important. Application should preferably be made just before the beginning of spring growth or if subsequently, just after the cut. Little if any check is given to the lucerne if this practice is followed. Lucerne has been checked for up to a month by applying dalapon to long growth.

Results are best if the application is followed by 2 to 3 days of fine weather. Excessive damage has been noted where the chemical has been applied in the dormant period or just before the onset of spring growth and heavy rain has followed the application. If this occurs, the dalapon is not absorbed by the foliage but is washed down into the root zone of the lucerne and damage results by absorption through the roots. Dalapon has not given good results if applied at the end of the growing season of the lucerne. The grass present is readily killed, but *Poa annua*, if in the area, usually germinates in the bare areas left before the lucerne starts to grow.

BRASSICAS Dalapon has been used on four trials in swedes and turnips. Further work is required, but it is doubtful if dalapon will give sufficient control of broad-leaved weeds to warrant its use.

BARLEY GRASS With the build-up of fertility in many areas, both on sheep and dairy pastures, barley grass is increasing rapidly. As with docks and buttercups, improving farm practices only leads to a further increase of barley grass. Chemicals appear to offer the best means of control. Dalapon applied at 1lb. to 2lb. per acre in a minimum of water has given excellent control of barley grass in the seedling stage.

Rates of 1lb. to 2lb. have little effect either on established clover or grasses such as ryegrass and cocksfoot. Further, because there is no residual action in the soil, the area treated may be oversown immediately after application or even before. Dalapon offers sufficient selectivity to warrant large-scale use in checking the spread of barley grass.

OVERSOWING AND CULTIVATION TRIALS In preliminary trials dalapon at rates up to 5lb. per acre has shown promise as an aid to oversowing of pastures. The 5lb. rate kills or severely suppresses browntop and chewings fescue, but has little effect on clovers, ryegrass, or cocksfoot. Once the competitive effect of the rootbound mat of browntop and chewings fescue is removed oversowing in the decaying litter is expected to be more successful. On steep areas, where cultivation costs are high, work has shown that a seed-bed is obtained more readily if dalapon is used to break down a rootbound mat of browntop and chewings fescue. A possible use is to break down the turf before ploughing and thus reduce the time of fallowing.

GRASSES Dalapon has shown promise for the control of nassella tussock, paspalum species, tall fescue, and *Glyceria* species. The rates of application required are, however, sufficiently high to affect all species present, but are considerably less than the rates required to control these weeds with TCA. In one trial TCA at 150lb. per acre gave poor control of tall fescue, but dalapon in the same trial gave a high percentage of kills at 20lb. per acre and killed all plants at 40lb. per acre.

The successful control of *Glyceria* species is an important discovery, as these species are difficult to control in low-lying areas where drainage is a problem. In trials *Glyceria* species have been killed both on dry land and when floating on water with dalapon at 25lb. per acre.

Dalapon has given good control of rhizomatous grasses such as couch, but repeat applications are necessary for eradication. Grasses with a rhizomatous growth habit are probably best controlled by TCA in conjunction with cultivation plus the sowing of a resistant crop such as brassicas or potatoes.

OTHER USES Initial work indicates that dalapon will be useful for the control of grass weeds in orchards or adjacent to hedges. Provided the material was applied so that it did not reach the soil, no damage has resulted from its use. If rain occurs within a few hours after the application and the material is washed into the soil, subsequent damage may follow, depending on the species. Trials in ditches and irrigation races have shown this material to be of great value if the weeds are dominantly grass.

CONCLUSIONS Dalapon has proved an exceptionally promising chemical, but further experimental work is required before it can be evaluated fully. More work is needed on specific weeds of certain areas. Dalapon is not completely selective for grass weed control and if washed into soil may cause damage to crops such as lucerne, asparagus, hedge plants, and others. It must therefore be used with care when grass weed control is being attempted among such plants. Later investigations may show that this chemical can be mixed with hormone preparations for general weed control. To date work on these lines has failed to give control of broad leaved weeds.

—L. J. MATTHEWS

Home Cleaning

By EVELYN E. MOORE,
Field Officer in Rural Sociology,
Department of Agriculture,
Palmerston North

A CLEAN and shining home is an ideal cherished by most women, even if it is one that is difficult to attain when small children and the muddy feet of farm workers make cleaning seem a never-ending task. New surface materials, equipment, and cleaning agents, though they help to lighten the housewife's task, may also unwittingly be used wrongly, causing more instead of less work or even an expensive redecorating programme. In this article and a second article in next month's "Journal" are given home cleaning suggestions which it is hoped will help the inexperienced housewife to avoid costly mistakes and perhaps enable the experienced housewife to use new cleaners and new household materials to greater advantage. Next month the care of kitchen, bathroom, and laundry equipment will be discussed and the removal of some common household stains will be described in more detail, with a list of very useful cleaning agents both for regular use and for special stain removal.

Long-handled mops, including those with synthetic sponges, are ideal for washing linoleums and similar types of floors.

Floors

Not only may floor coverings be expensive items in home furnishing, but as they undoubtedly receive hard wear, they are frequently the first things that have to be replaced. Proper care and cleaning can greatly extend their useful life, so merit some attention. Listed, therefore, are suggestions for cleaning and caring for floors and floor coverings, including some of the newer and less-well-known ones. In addition, as wax is regarded as one of the best preservatives for many types of floors and as floor polishes have improved considerably in the last few years, comments on different types of polish may be of interest.

Polishing Waxes

Three main types of wax polish are available. First, there is the well-tried paste wax, which consists of such common waxes as beeswax or paraffin wax, softened and made into a usable paste by the addition of solvents. A development of this type is the liquid polishing wax, also called a liquid spirit or solvent polishing wax, which is the same as the paste wax but which has been made liquid by the addition of more solvent.

Paste and liquid solvent polishes maintain their popularity because they are cheaper and also because they have a cleaning as well as polishing effect. This is particularly true of the liquid type, which is often applied over old polish, the rubbing and polishing helping to remove dirt. Paste waxes are widely used on wood and linoleum floors; liquid ones are used mainly on wooden floors.

The polish should be applied in a thin, even coat, allowed to dry for about 20 minutes, and then polished.

Finally, there are the relatively new liquid, water-emulsion polishing waxes which can be used on practically all types of floors. They usually contain carnauba wax, which is very hard and therefore provides a more durable wax film than does beeswax or paraffin, for example. The wax is sold in the form of a water emulsion and may if desired have more water added before application, according to the needs of the user. Water-emulsion waxes are unlike paste waxes in that best results are achieved only when they are applied to a thoroughly clean floor free from traces of soap or cleaning powders. A small amount of wax is poured on to the floor to form a small pool. This is soaked up in a cloth and then spread smoothly and as evenly as possible, with straight strokes instead of the usual polishing technique. The wax dries to form over the floor a thin, hard, protective layer which is water and stain resistant. After three or four applications the floor is completely protected. In effect traffic is walking on the polish and not on the flooring material and the need for washing is greatly reduced. Damp mopping with clean water which does not remove the wax is then usually all that is necessary to clean the floor.

These water-emulsion polishing waxes sometimes have substances added which help decrease their slipperiness, though it is not, of course, possible to make a completely non-slip polish. The increased danger of slipping on polished floors is a factor that each housewife will have to weigh against the obvious advantages of increased wear, better appearance, and greater ease of cleaning. Slipperiness

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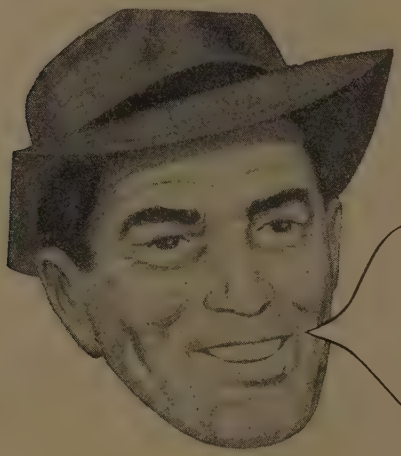

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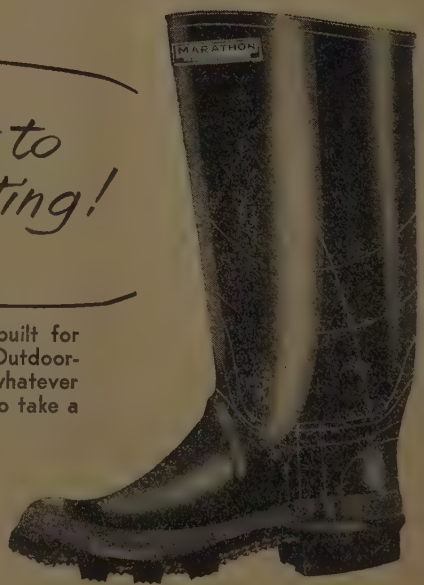

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BY SKELLERUP

can be minimised by using polish sparingly and allowing it to dry thoroughly before polishing, by using polishes containing non-slip substances, or by wearing shoes and slippers with non-slip soles and heels.

Wooden Floors

All but oiled floors may be waxed and polished. This helps to increase the durability of the finish and also makes it more stain resistant, particularly to problem stains such as ink and medicines which, if wiped up immediately, will leave no stain on well-waxed and well-polished floors.

Paste and liquid solvent polishes penetrate the floor and protect and preserve it, and if they have been properly applied, they do not need frequent renewal. Regular dusting with a soft, dry mop will keep floors clean between polishings. If the floors receive hard wear and mud and other types of heavy soiling, the emulsion polishing waxes which can be washed with clean water without removing the wax will probably prove more satisfactory. Wipe up spots and stains immediately. Use turpentine for greasy spots and stains and a damp cloth for liquids and other non-greasy foods. Afterward rewax and polish the stained area if necessary.

When it seems desirable to wash a polished floor use a mild, neutral soap or detergent and water sparingly; rinse and dry thoroughly. Slopping on water extravagantly or using harsh soaps and cleaners will probably injure the finish or raise the grain of the wood and cause it to develop a rough, uneven surface.

Do not use oil mops on wax floors, as they make the surface sticky and dull, and do not use water-emulsion polishing wax after or alternately with solvent liquid or paste waxes, as they do not mix well together.

Gloss lacquer floors wear well and can be washed with luke-warm soapy water if necessary. They do not have to be waxed, and as worn patches can easily be relacquered without unsightly patch marks showing, they are in many respects more useful and durable than varnished floors.

Varnished floors wear better if waxed, and as they are difficult to revarnish successfully without cleaning away the old varnish, it is desirable to wax them. If they are not waxed, avoid washing them, as frequent washing greatly reduces their durability. If they have to be washed, do not let pools of water stand on the floor, wash a small area at a time, and dry it before going on to the next piece.

Shellacked floors are not durable unless they are kept waxed and polished. As water causes whitening of the shellac, they should never be washed. Soiled areas may be treated with a cloth dampened with methylated spirit. Avoid using too much spirit, as this will also remove the shellac.

Painted floors may be waxed if desired. It is particularly important not to use coarse abrasives in cleaning them, as they rapidly ruin the paint surface. If they are washed, use a minimum quantity of washing water and rinse away the soapy water with a cloth wrung out of clean water.

Dust oiled floors with a lightly oiled mop and when necessary wash them with mild soap and water. After the floor has dried a fresh coating of warm oil may be applied with a mop. It should be rubbed in thoroughly, excess oil being wiped up with a clean cloth to avoid a slippery, dust-catching surface.

Cleaning Hard Floor Coverings

A wide variety of hard surface floor coverings is available today. Their durability, of course, varies considerably, but if they are properly cared for, price can be taken as a fair indication of their true worth.

A useful general rule to remember for cleaning all of them is to use minimum quantities of water and to scrub them as little as possible. Excess water seeps between the seams, even in glued floor coverings, and loosens the adhesive, so that they may warp, crack, loosen, or curl. Scrubbing or the use of harsh abrasives and strongly alkaline soaps roughens the surface and increases wear.

Wash hard floor coverings with a cloth or mop (the synthetic sponge type is good) wrung out of warm suds made with a mild soap or synthetic detergent. A small amount of kerosene, which helps dissolve grease, may be added to water used for washing linoleum. Rinse the linoleum with a mop or cloth wrung out of warm water and wipe it dry.

Waxing helps to preserve linoleum and cork tiles and makes them more resistant to staining by ink and other problem materials, but is not essential except on surfaces such as bench tops that are much exposed to water. Wax looks best and is less slippery when applied in a very thin coat and well polished. Self-polishing (water emulsion) liquid waxes may be used, but the directions on the container should be followed carefully.

In fact, water-emulsion waxes are the only practicable ones to use on rubber, cork, or asphalt tile floors or bench surfaces, as they are guaranteed not to damage these materials.

Substances which damage rubber, cork, and asphalt tile include fat, oil, solvents used in paste and liquid waxes, petrol, acids, heat, and excessive soap and water. Benches

Many of the floor mops now available have some type of patent wringer which speeds up the washing and reduces stooping. In this mop the sleeve slides down when required, pushing the two sides of the mop head together and squeezing out surplus water and suds.

covered with rubber sheeting should, therefore, always be wiped dry after use. If the housewife is in doubt about the type of wax polish to use on any surface, it is advisable to find out the ones recommended by the manufacturers and to use them only. Do not use oiled mops on any of these coverings.

A relatively new type of floor covering made of poly vinyl plastic, though more expensive, is stated to wear well and to be highly resistant to ordinary household materials causing soiling and damage; it is easily cared for, polishing not being necessary. It is also very resistant to staining by such problem materials as ink, medicines, and acids, as the hard, smooth surface is non-absorbent.

Carpets and Rugs

A good rule for cleaning carpets and rugs is "a little and often". As with all woollen goods light, frequent cleaning is much more effective than less frequent but hard cleaning.

With hard wear daily vacuum cleaning may be necessary, but normally light sweeping with a carpet sweeper and weekly vacuum cleaning is sufficient. Shaking mats and beating carpets is not advised, as it causes excessive wear. Recommendations regarding the use of vacuum cleaners on new carpets should be followed.

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Carpets should be vacuum cleaned regularly and thoroughly. This not only removes dust and grit, which cause wear, but checks the ravages of beetles and other insect pests, which only thrive when left undisturbed.

Stains should, of course, be removed as soon as possible.

Thorough shampooing—especially of a large carpet—is apt to be time-consuming and tedious, and many housewives may prefer to leave it to experts. However, for the housewife who decides to clean a rug or even a carpet herself, the following suggestions may be useful.

Use synthetic detergents in preference to soap. The mild ones, either those labelled carpet shampoos or those especially recommended for washing woollens, should be used. Some synthetic detergents contain alkalis for use with cottons, linens, and especially greasy or dirty cloths, and these should not be used.

When detergents are used for cleaning rugs follow the directions on the label for diluting them with water, whip the mixture up thoroughly, and use only the suds, wetting the carpet as little as possible. Brush the suds into a small area of carpet at a time, then wipe the area with a clean, damp cloth. Repeat the treatment if the carpet or mat is very dirty. Overlap the areas treated to avoid forming dirty rings.

If moths or carpet beetles are a problem, a moth-killing compound such as lindane could be mixed with the rinsing water. Permanently moth-proofed carpets can now be bought and are certainly a good investment in areas where moths or carpet beetles are troublesome.

Walls and Ceilings

Vacuum cleaners and other labour-saving equipment have lightened many household tasks, but dusty walls and cobwebby ceilings still have to be dealt with largely by more old-fashioned methods, though the vacuum cleaner can be substituted for the duster-covered broom. If left for too long, dust becomes more difficult to remove, as combining with moisture and perhaps grease it forms a crusty film that cannot easily be dusted away. Regular cleaning with the wall brush attachment of the vacuum cleaner or a soft wall brush therefore pays dividends. It is best to start at the ceiling and work down, using a light side to side movement. Clean behind mouldings, window frames, and pictures and if it is practicable, shift pictures around occasionally to avoid the formation of picture marks and to lengthen the life of the wallpaper. The relatively new dust-absorbent dusters may also be used for cleaning walls.

Washing Walls

All glossy paint surfaces on walls and many flat ones can be successfully washed. Wallpapers and varnished or stained walls are more difficult.

Painted Walls and Ceilings

Unless the paint on a wall or ceiling has a glossy surface, test it in some inconspicuous place for washability,

From a painting depicting the M.V. "Rangitiki" of the New Zealand Shipping Co. Ltd., and the famous "Jervis Bay" in the well-known action of 5th November, 1940.

The link they could not break

With all the strength that was in them, they tried. Every weapon they had, they used: aircraft, bombs, torpedoes, surface raiders, mines, some of them off New Zealand itself.

And some success they achieved; but never once did they wholly break the link which joins New Zealand to the rest of the world. Always, some ships got through.

No need to extol the men who sailed the ships of the British Merchant Navy during the War. But behind that epic of the sea, another drama was taking place in the boardrooms of the Companies.

For example, between August and December 1940, the New Zealand Shipping Company (and its associate, the Federal Steam Navigation Company) lost by enemy action almost one-fifth of its total fleet. And, clearly, that was not to be the end of the story. What should the Companies do? Ought they to rebuild them—and face the considerable risk of losing the money thus invested; or should they wait until the War was over?

The Lines never forgot that New Zealand depends on them as they depend on New Zealand. And so the Companies decided to rebuild—while the War still raged.

The decision was both rare and courageous—how courageous is shown by the fact that at least one of the war-time launchings (the motor-ship 'Nottingham', 8,532 tons) never lived to enter a New Zealand port. She was torpedoed in the North Atlantic seven days out on her maiden voyage.

But the Companies were not deterred. And, although more than half the original fleets had been lost by the time the War ended, a steady succession of new vessels was coming from the shipyards. The continuance of New Zealand's shipping service was thus assured.

The British Government War Risks Insurance Scheme met part of the price. But upon the Companies themselves fell the responsibility of providing millions in order to restore New Zealand's shipping link to its former strength.

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and if painted-over wallpaper is to be cleaned, be careful to use minimum quantities of water and not to let water soak into or run down the paint.

Any mild soap or detergent and water may be used. Regular use of synthetic detergents containing alkalis ("built" detergents), harsh soaps or soap powders, or coarse abrasives is not recommended, as they soon roughen the paint surface, make it more apt to soil rapidly and harder to clean, and therefore cause it to wear faster. Waxing and polishing paint surfaces which are likely to soil quickly, around ranges or sinks for example, will make daily cleaning quicker and easier and considerably lengthen the life of the paint.

When walls are being washed it is advisable to start at the baseboard and work up, cleaning 3ft. or 4ft. areas at a time and overlapping each section.

Wring out the cloth, sponge, or sponge-mop tightly to avoid dripping the water and streaking the walls, and finish by rinsing the wall with a cloth or sponge wrung out of clean water. Stubborn stains may be treated with a fine abrasive powder, but care should be taken not to roughen the surface more than necessary.

Cleaning Wallpapers

The satisfactory cleaning of wallpapers which have become badly soiled is difficult and not always practicable. First, it is necessary to ascertain the type of wallpaper to be cleaned, as each type requires different treatment. Even if one is fairly certain of the wallpaper type, however, it is always advisable to try out the proposed cleaning method in an inconspicuous corner before proceeding to clean large areas.

Washable wallpapers cannot be treated as painted surfaces, as the paper backing limits their durability. Lukewarm water and a mild detergent can be used to wash them, however. Use the quantities recommended by the manufacturer.

Wring out the cloth or mop very thoroughly and stroke the paper gently, from the baseboard up. It is most important to use as little water as possible. After washing the paper wipe it down gently with a cloth wrung out of clean water to prevent streakiness when the paper dries out, and gently pat it dry.

Flat pulp paper can be cleaned with a dough prepared as follows. Mix 3 tablespoons of flour with 1½ tablespoons of white spirit. Add sufficient water to make a stiff dough and knead it well. Use the dough with long sweeping movements, overlapping each stroke. As it becomes soiled turn it to expose a fresh surface.

Roughly textured papers are, however, better cleaned with stale white bread. Remove the crusts and rub the paper gently in even strokes. Brush off the breadcrumbs or remove them with the vacuum cleaner.

Cleaning washable wallpaper. A patented plastic sponge cloth which is thoroughly wrung out of lukewarm water and mild soap or detergent ensures that the paper will not become too damp and that the water will not run down and streak the wallpaper.

Mica-finished papers and others with special painted or finished surfaces cannot satisfactorily be cleaned in this way, as mica rubs off and the colours often streak. Light brushing or vacuum cleaning is all that is possible if the appearance is to be retained.

Wax-finished papers, which often resemble wood grains, are glossy but not always washable, and may not be satisfactorily cleaned with bread or dough. The waxy surface does not attract dust, so they are easy to keep clean, but they are not a practicable choice for children's rooms or anywhere where they are likely to be marked by spilt food or fat, and pencil or crayon marks, because of the difficulty of removing such marks easily without damaging the waxed surface.

Furniture

The days when beaters were used for carpets and upholstered furniture have long disappeared. The few beaters that remain serviceable are even achieving a new value as heir-

looms or curiosities with penny-farthing bicycles, Mrs. Potts irons, and other relics of the last century. Instead the furniture brush of the vacuum cleaner is in almost universal use. Modern living arrangements have made necessary the design of furniture with a minimum of dust-catching crevices. Scratch-resistant finishes on wooden furniture and upholstery fabrics which wear well and are easily cleaned are also necessary to keep furniture looking clean and attractive.

Wood Surfaces

To maintain the sheen of wood surfaces use either wax or a good oil-type furniture polish, but do not use both indiscriminately, because the oil softens wax and makes the surface appear dull and sticky. If it is necessary to change from one to the other, wipe the wooden surface thoroughly with a cloth wrung out of warm water and a mild, neutral detergent or soap, and follow with one wrung out of clean water to remove soap.

Any type of wax furniture polish may be used. Whichever variety is chosen it should be applied in thin coats with the grain of the wood, then polished or not according to the directions on the container. Its regular use will keep furniture looking new much longer.

The treatment of stains on polished wood surfaces is usually difficult, but as in all types of stain removal immediate action and correct procedure will help minimise or even remove completely what could become an ugly stain on valuable furniture.

Upholstered Furniture

Upholstered furniture is generally easy to care for. Routine dusting or vacuum cleaning is, of course, necessary and reduces wear caused through dust or grease becoming ingrained in the covers. It is recommended, especially for chairs that receive hard wear or chairs that are to be loose-covered, that extra arm covers and, if possible, extra seat covers be used. This will greatly increase the life of the covers.

Dust and clean leather-upholstered furniture as required with saddle soap or with thick suds made of mild, pure soap with as little water as possible. Wipe off traces of soap with a clean, damp cloth and polish briskly. To prevent the leather cracking it may be rubbed once or twice a year with castor oil or a good commercial leather conditioner. Rub the oil in thoroughly and wipe off any traces of surplus oil to avoid soiling clothing.

Furniture upholstered with foam rubber is becoming increasingly popular and deservedly so. However, one precaution is necessary in its use, dry-cleaning liquids may damage the rubber, so these should be used very sparingly or preferably not at all for removing stains from the upholstery fabric. Soap and water or a detergent are safer, especially if the fabric is colour-fast.

Most upholstered furniture may be shampooed at home, but as the work is tedious, many housewives may prefer that a commercial shampooing firm should do the work. It is better to use a special carpet or upholstery shampoo and to follow the same procedure as in shampooing carpets, keeping the upholstery as dry as possible. First test the fabric in an inconspicuous place for colour-fastness. Thorough drying to prevent mildew formation is also essential.

Windows and Mirrors

Though nowadays so many of the former tedious household cleaning tasks are simplified or can be done easily with labour-saving equipment, window cleaning has become one of the more laborious household tasks, especially in modern homes with large window areas.

Care of windows means more than washing window panes; it should include also a check on the condition of shades, blinds, window fixtures, and curtains or draperies.

In window washing the housewife can probably achieve the best results and avoid undue fatigue by careful attention to the method and equipment used rather than to any special window cleaning solution. Many professional cleaners use only clean, warm water to which a little detergent is sometimes added, but their tools and equipment are kept at a peak of efficiency.

However, the following agents used with water may make the task a little easier, though the final choice will depend on the personal preferences of the housewife.

Vinegar or ammonia—1 tablespoon to each quart of water.

Synthetic detergents, borax, or kerosene—about 1 to 2 teaspoons to each quart of water.

Methylated spirit—about ¼ cup to each quart of water.

Washing soda—1 to 2 teaspoons to each quart of water.

Alkaline solutions (soda and ammonia) and methylated spirit should be handled carefully, as they can damage painted, lacquered, and varnished surfaces.

Some people prefer the mild cleaning powders such as whiting. Those in cake form are easier to handle.

Commercial liquid cleaners which usually contain alcohol are also available. These are often sprayed on and wiped off with a clean, lintless, absorbent cloth or chamois leather and usually produce good results. For ordinary cleaning a chamois leather is still the most efficient, though the long-handled plastic-sponge cleaners are very useful. As they are not, however, quite as absorbent as chamois, it is slightly more difficult to attain completely smear-free windows with them and it may be necessary to polish the window after it has dried.

To clean the windows moisten the chamois or sponge or cloth and squeeze it as dry as possible. Wash one pane at a time and avoid using scrubbing, circular movements which waste energy. Straight up and down or sideways movements which avoid covering the same ground two or three times save time and energy. Avoid washing or hosing windows in strong sunlight, as this may cause the window to streak. Polish immediately with a clean, damp chamois or soft, lintless cloth. If using a cleaning powder, apply it in a thin film and wipe it off with a second cloth when it is almost dry.

Avoid using soap, as careful rinsing, which is time consuming, is needed to remove soap, which otherwise might smear the window panes.

Window Shades and Blinds

Regular dusting is important for the care of all blinds, but it is apt to be rather time-consuming work with venetian blinds. Feather dusters are not efficient; they merely displace the dust and spread it in the air ready to settle back on the blinds. Where many venetian blinds require dusting the use of vacuum cleaner attachments or one of the handy lambswool multi-fingered brushes saves time.

To use the former turn the blades of the blind flat and dust one side; then turn them the reverse way and do the other side. To use the latter, tilt the blades to the full-light position and do several at a time.

About once a month, or less frequently if they seem quite clean, wipe the blinds with a damp cloth wrung out of sudsy water or ammonia and water. If thorough cleaning seems advisable, take the blinds down and wash them carefully. Using the bath and completely immersing the blind is not recommended, as this can damage the finish or the mechanism or cause the tapes or cords to shrink as well as sometimes leaving marks on the bath which are difficult to remove.

Draperies and Curtains

Regular brushing and dusting of draperies and curtains will mean less frequent trips to the wash tub or dry cleaners and will lengthen their lives. Heavy, lined draperies are easy to clean with a vacuum cleaner attachment.

Soil Improvement in the Flower Garden

FEW gardeners have the pleasure of gardening on the ideal soil in which plants will flourish without much cultivation. In this article J. P. Salinger, Horticulturist, Department of Agriculture, Wellington, describes the operations required to improve the soil in the flower garden. The section on garden work for November is by Elspeth Gray, Horticultural Instructor, Department of Agriculture, Auckland.

WHEN a new house is taken over the gardener will find the new section a challenge. The house probably stands surrounded by a trampled area, bare soil with a wire fence, or a section with just a few pegs marking the boundary.

He will set about planning the development of the garden and wish to lay paths, plant hedges, and prepare the garden for lawns, flower beds, and the vegetable area. The preliminary work carried out by the gardener will lay the foundation for future success, and the most important work is soil improvement and management. Even though the garden is taken over in autumn and the time for planting approaches, adequate soil preparation comes first.

Even in an established garden the maintenance and improvement of soil fertility is the goal of the gardener's activities. It is only in really old gardens with large well-established trees and shrubs tending almost to woodland or bush conditions that the gardener can relax and allow these plants to grow without digging, cultivating, or applying quantities of organic matter.

Soil improvement is carried out in two ways; physical and chemical. Physical methods of soil improvement are basically obtaining and maintaining good drainage, correct cultivation, and the addition of organic matter. The chemical aspects are the maintenance and addition of the chemical elements essential to plant growth.

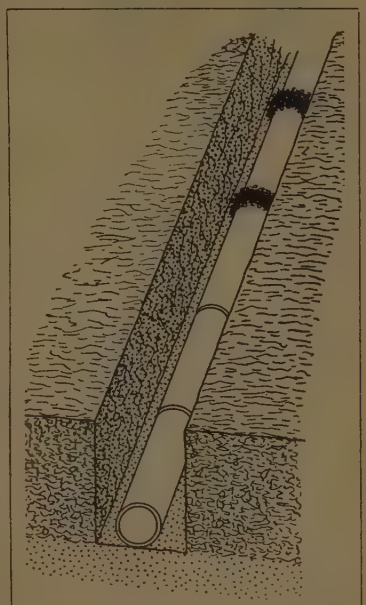
Soil Improvement on a New Section

Drainage

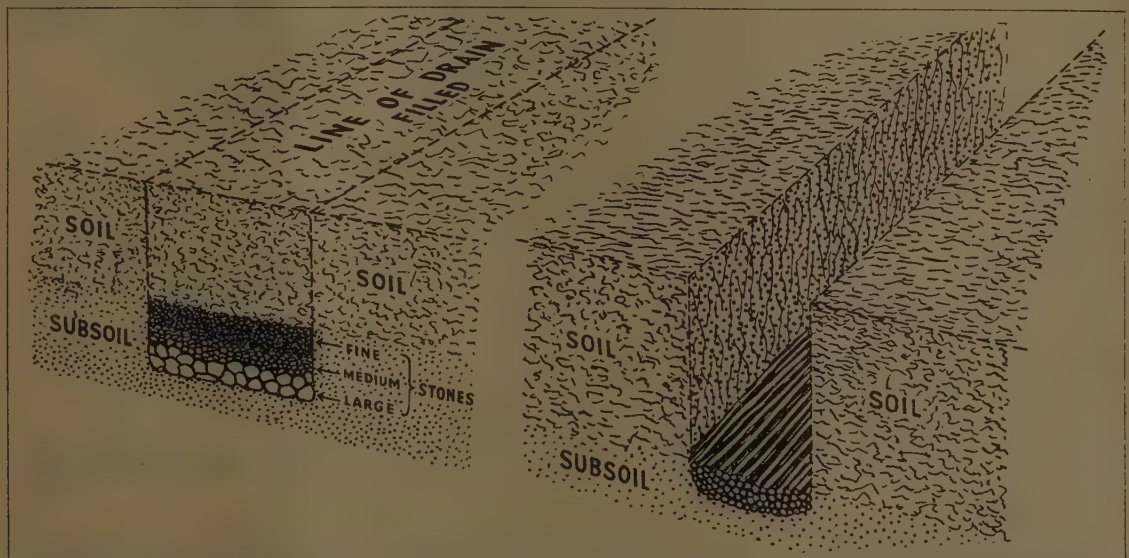
A well-drained soil is essential for successful gardening. In all garden soils the water should be constantly moving; down to the lower layers after rain or artificial watering, and up to the surface in dry weather. The water in the soil should never be stagnant or permanently filling the spaces between the crumbs of soil. The aim of drainage is to canalise surplus water and dispose of it efficiently.

Poor drainage may be due to various causes, each of which needs different treatment. Excess water may be due to:—

1. Water rising from a spring. This will need to be led to a creek or a gully or piped to storm water drains.
2. Water running off higher ground or from hard, paved areas like paths and drying yards or gutterless roofs. Water running off higher ground or banks or slopes should be collected in an open channel laid at the base of the



Tile or field pipe drains should be shallow enough to allow water to percolate freely into them. A space of ¼in. between the ends of the pipes facilitates the entry of water. The trench can be backfilled with soil, but where the pipes are laid at the base of a bank or slope, metal or brushwood should be used to fill the trench.



Two methods of filling a channel drain. On the left hard stone and metal have been used to fill part of the channel; on the right brushwood or manuka scrub has been laid in the base of the ditch. Where the topsoil is impervious to water the stones or brushwood should fill the trench to the surface.

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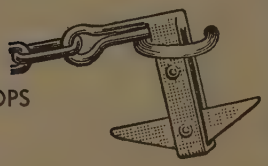

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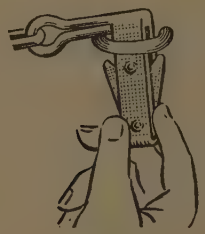

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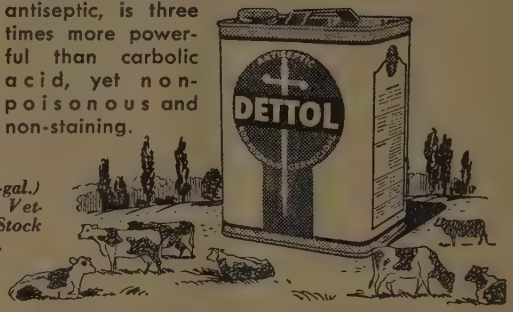

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slope. This channel, if backfilled with coarse material, is often more effective than a tile drain. Paved areas should preferably be run to a storm-water gutter or trap; alternatively the surface should be sloped to run to a tile drain or channel leading to the outlet. Gutterless roofs should have a gutter attached and this should be piped to storm-water or other drains, or to a storage tank or a sump.

3. A close, retentive soil preventing the rainfall soaking into the lower layers; soil improvement by digging and the addition of organic matter is more practicable than drainage. Small, shallow channels round beds, borders, and lawns will help, if outlets can be found for them.
4. A hard, impervious pan or rock layer beneath the soil surface. Little can be done to drain the whole garden if the pan or layer is near the surface. A thin iron pan may be broken in places with a crowbar to allow the water to drain away.
5. A high water-table in low-lying areas. The water-table is the level in the soil where water is permanently present. Little can be done to prevent water entering the section, but any channels or ditches round it should be kept clear and beds should be raised if possible.

Outlets

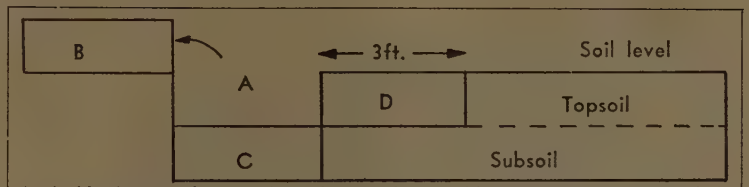
Before a drain or drainage system is installed consideration must be given to the outlet. It is useless making a channel from a wet area in the garden unless the water can be drained away to a suitable outlet. There are four ways of disposing of water from the garden:—

(a) It can be led into the storm-water drains, but not the sewerage, of the house. Permission of the borough or county engineer should be obtained before this is done.

(b) It can be run into the storm-water channels of the road. Permission is not usually required for this.

(c) It can be drained into a creek or gully; this is a satisfactory method provided the creek is kept clean and free from rubbish, so that it flows freely at all times. Storm-water may be allowed to flow from upper levels to lower ground however inconvenient it is for the owners of low-lying sections. In the lower areas the only satisfactory method of dealing with this problem is to drain the water away as it enters the section.

(d) It can be drained into a sump or soakpit. This consists of a deep pit filled with gravel, large boulders, or any other material that will not collapse and become saturated with water. Rotten timber, old iron, or soft metal rubbish is usually unsuitable, as it gradually rots away and the soakpit becomes a damp hollow. The pit itself must reach a permeable layer of the subsoil or be drained into a storm-water drain or channel.



In double digging, the topsoil is taken out for a width of 3ft. across the plot (A) and is heaped at the end of the adjacent plot (B). The subsoil is then forked over and the topsoil from the next strip (D) is dug over on to C.

Types of Drains

Whatever the type of drain, it should flow freely at all times. Neither the drain nor its outlet should become blocked with debris or soil. Serious flooding of a house or garden can occur through tile drains becoming blocked with tree roots or outlets covered in twigs, leaves, and other garden refuse.

Three types of drains are commonly used in a garden; open channels, inverted box drains, and tile drains.

In its simplest form an open channel is merely a trench taken out along the edge of a bed or plot of ground. In most gardens this will be quite effective provided there is a good outlet. A channel is also adequate at the base of a steep slope or bank. In this case it is better to backfill the channel with broken brick, metal, or hard rock. Soft rocks tend to break down and run together, becoming impervious to water. If the channel is left unfilled, it must be regularly cleared of debris falling from the ground above. Where manuka or brushwood is plentiful this can be used to fill the channel.

Box Drain

Where a channel or open drain has to be taken across a path this can be bridged by a box drain. This is a framework of timber, consisting of a top board nailed firmly to two side boards; these press against the edge of the channel, and the water flows beneath the top board.

Tile drains are excellent for draining a garden permanently. They may be necessary where there is a large impervious area such as a concrete terrace adjacent to the garden. Agricultural tiles of baked clay or concrete 2in. or 3in. in diameter are usually large enough; they should not have collars, and should be laid with their ends about ½in. apart; they should not be concreted together.

The trench for the tiles should be dug from the outlet back to the point of origin; the base of the trench should slope 1ft. in 100ft. or more. It is seldom necessary to use surveying instruments to ensure the correct fall; a carpenter's level placed on a long, straight board will indicate whether there is sufficient fall.

If a large area of ground is being drained by tiles, backfill similar to that recommended for filling open channels should be placed directly over the pipes. The topsoil can then be used to fill the trench.

In some gardens it may not be possible to cut channels or install tile drains. It is still possible to ensure that flower beds are reasonably well drained by raising them above the level of the surrounding area and making sure that water does not run into them from other areas.

Soil Improvement by Cultivation

Apart from drainage an uncultivated soil is brought into a workable condition by digging and the application of organic matter.

In the flower garden there is usually only one opportunity to dig the soil thoroughly. That is before any trees, shrubs, or hedges are planted or lawns made. Once these are established it is only possible to dig the borders in which herbaceous and bedding plants are grown and to fork the soil lightly around the permanent plants.

When the soil is being prepared for a new garden the area should be double dug. In double digging the topsoil is removed for a width of 3ft. across the plot and the subsoil dug over with a fork; the topsoil from the next strip is then turned on to the dug subsoil and the process continued across the plot (see the diagram on this page). This operation is sometimes incorrectly called "trenching". If the plot is divided in halves lengthways, it is only necessary to barrow the original topsoil a few yards, adjacent to the area where the last trench is taken out. (See the diagram on this page.) The subsoil should not be brought to the surface in double digging. This operation provides an opportunity to mix coarse organic matter such as stack bottom or half-

rotted compost into the subsoil. If there is no grass or turf on the surface, rotted organic matter should be mixed with the topsoil.

Where the plot is covered with grass this should be mixed with the topsoil by each spadeful of soil being chopped up as it is turned over. The grass may contain grass-grubs, wireworms, and other harmful insects; a dressing of proprietary grass-grub killer should be dusted over the surface, or 50 per cent. DDT wettable powder applied at 1½lb. to 1000 sq. yds. If wireworms are also present in quantity, 2 per cent. lindane dust should also be applied at ½oz. per square yard. A new material, aldrin, is proving useful for the control of both these soil pests. Though the grass may have been a well-grazed paddock, it will still be necessary to apply fertilisers when the actual planting is done.

Liming

After the plot has been dug, lime will be required, except on soils where it occurs naturally. It should not be applied where rhododendrons, heaths, and other lime-intolerant shrubs are grown, or where the lawn is to be sown. A dressing of agricultural lime at 4oz. to the square yard should be dusted over the soil after the digging has been done.

Lime has both a chemical and physical effect on the soil, it neutralises acidity, releases other chemical elements, provides the element calcium, and assists the minute clay particles to form larger crumbs of soil.

In a few areas the subsoil may consist of solid rock or large boulders and gravel. In this case double digging is not possible, and even more emphasis must be placed on improving the topsoil by regular applications of organic matter. When trees or large shrubs are to be planted in these areas the subsoil should be broken up with a pick or crowbar but not removed. This work should be carried out in winter, and if water collects in these prepared holes, as may also occur where there is a clay subsoil, it is preferable to choose a slightly different position and set the plants in the topsoil only.

Soil Improvement in Established Gardens

When an established section is taken over it is not always possible or advisable to try to carry out major improvements. Low-lying or badly drained beds and borders can be improved by leading the water away in channels.

The main emphasis will be placed on the application of organic matter and the use of lime and sufficient fertilisers. Double digging will be possible only where a flower bed is completely remade, but digging of the topsoil in established borders provides an opportunity to work in organic matter.

However, the topsoil may also be improved on a heavy soil by dressing the soil regularly with coarse sand or fine grit and by mulching with materials such as sawdust which decompose slowly.

Where seeds are to be sown the soil must be of an open texture and good tilth. Good tilth implies that the soil can be broken down to small particles which will neither run together when soaked with water nor crack open when the soil dries out. On heavy soils this can be obtained by adding well-rotted organic matter and coarse sand to the soil; on light soils well-rotted organic matter only will be required.

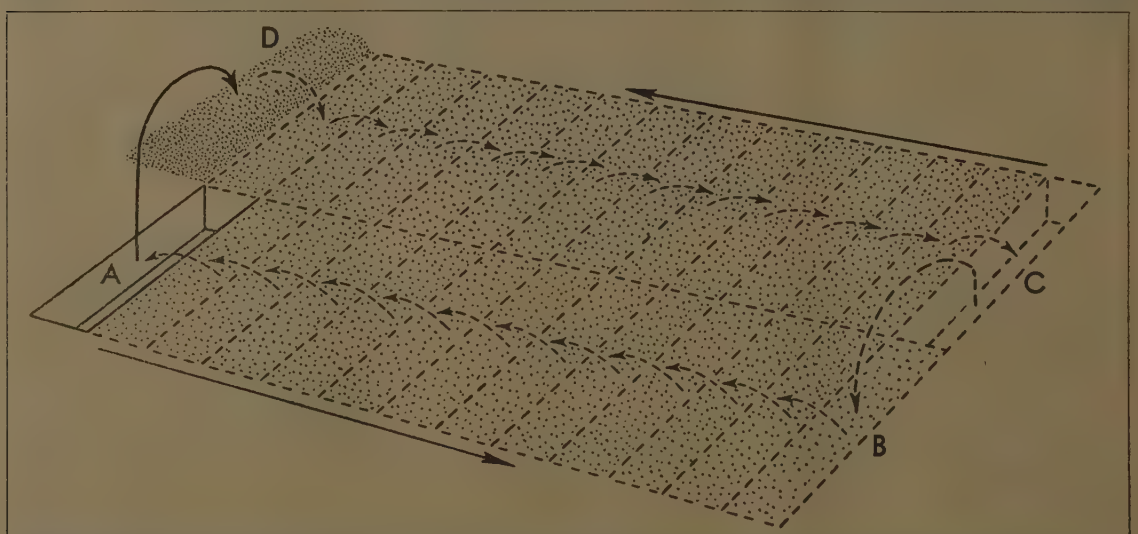
The chemical soil conditioners promised to be of great assistance to the home gardener, but in practice their use is limited by their price to the preparation of seed-beds in heavy soil. Similarly, some inert mineral materials are available to gardeners; so far their use has been confined to plant propagation in frames, pots, and boxes. They can be used similarly in seed-beds or in propagating beds in the open.

Mulching

Mulching is one of the best methods to improve soil texture in the surface layers and retain moisture in the soil. When it is mulched the soil surface is covered in spring and summer with a layer of organic material 1in. to 3in. thick.

Typical materials used for this purpose are animal manure with plenty of litter, partially rotted compost, spent hops, peat, leafmould, lawn mowings, and sawdust. These will all conserve soil moisture, keep the soil cool, and improve soil texture; the animal manure is the only material that will readily supply plant nutrients.

In fact, fresh sawdust will deplete the soil of nitrogen as it rots down;



The simplest method of digging an area of ground. The plot is divided lengthwise and the soil from trench A is placed at D. Digging continues until the soil is removed at B. The soil from C fills the trench at B and the second half of the plot is dug; the soil from D fills the last trench. The long arrows show the direction in which the digger moves; other arrows indicate the direction in which the soil is thrown.

4oz. of blood and bone or 2oz. of sulphate of ammonia per square yard should be applied at the same time. Sawdust from timber treated with wood preservative should not be used, as the preservative may damage plants.

Lawn Mowings

Fresh lawn mowings should be spread in a thin layer only or allowed to wilt before they are used on the flower beds; even so they should be kept away from the stems of soft plants or shrubs; otherwise disease organisms may attack the plants where the mowings touch the stems.

Mulching material can be applied two or three times in the season, but it is essential that the soil is really moist when the second or third mulch is applied. By late autumn the mulch can be lightly forked into the topsoil; if the mulch is dug in deeply, its value in improving the surface soil will be lost.

Soil Mulch

Whenever possible the surface soil round plants should be worked with a hoe or tined cultivator; this destroys weeds, aerates the soil, and provides a layer of fine soil, which acts in a similar manner to a mulch of organic matter.

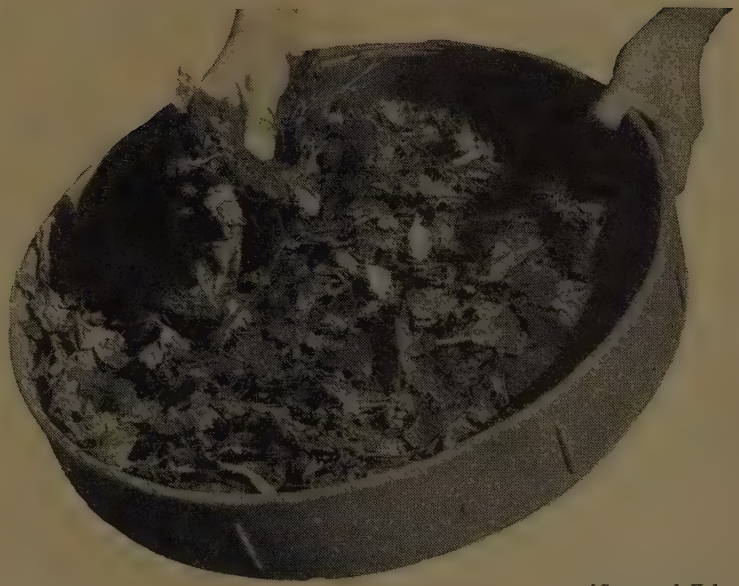
Use of Rocks and Stones

In windy positions or on sandy soil it is advisable when planting a tree or shrub to place two or three large stones or rocks round the base of the plant, as well as staking the plant. These keep the plant firmly in the ground and the soil beneath the stones remains moist and cool. Similarly, when cuttings of creeping plants like arctotis, gazania, and ice plant are inserted on a slope or bank two or three stones placed round a cutting will stabilise it and encourage rooting. Rock gardens are frequently surfaced with a thin layer of fine metal or grit to keep the soil cool and moist and suppress weeds.

Garden Work for November

Most summer-flowering annuals will be ready for transplanting by November. Further sowings may still be made in borders or in drifts under shrubs to flower later in the season in places which might otherwise be colourless. Larkspur, clarkia, and godetia do best if sown in the places where they are to flower. Sow seed sparingly to avoid the need for drastic thinning after germination. Seed of bonfire salvias, zinnias, and sunflowers, which prefer warmer soil than

MULCHING FLOWER GARDEN SOIL



[Green and Hahn

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Two methods of mulching, which is one of the best ways to improve soil texture in the surface layers and retain moisture in the soil.

Leafmould (above) is an excellent material for mulching plants in spring and summer.

Sawdust (below) can be used for mulching; a coarse type of sawdust, as shown here, can be spread under trees and shrubs. Nitrogenous fertilisers should be added when fresh sawdust is applied, and when rotted down it can be forked into the topsoil. Sawdust from timber treated with wood preservative should not be used, as the preservative may damage plants.

do most annuals, may be sown outdoors this month.

Where annuals are still to be transplanted this should be done as soon as they are ready. Young plants need to be fully established in the borders in order to keep on growing through the lighter rainfall period of summer. It may be necessary to water each hole thoroughly before planting if the soil is very dry. Beds being cleared for the planting of annuals for summer and autumn display should have a dressing of well-decayed manure or organic material. If organic manure is not available, a balanced fertiliser consisting of 3 parts of blood and bone, 2 of superphosphate, and 1 of sulphate of potash at 3oz. to the square yard may be dug in.

With most of the annuals coming away the future appearance of the garden should be considered. Seeds of biennials and perennials may be sown in November so that plants may be firmly established in their permanent positions before winter sets in.

Biennials are plants that do not flower until the second season and include such subjects as wallflowers, sweet william, myosotis, Canterbury bells, and Brompton stock. Some of these are not botanically biennials, but because they are easily raised from seed and produce their best display in the first flowering season, they are treated as such. Wallflowers are often kept in the garden for a number of years, but though they will continue flowering fairly satisfactorily, the plants soon become woody and the number and quality of the flowers are never quite as good as in the first season.

Biennials may be sown either in frames or in open ground, provided that the soil is moderately enriched and is broken up to a fine tilth before sowing. They may also be sown in boxes as for annuals and this method is recommended when there are likely to be difficulties due to weather or disease and insect pests. Some perennials may also be raised from seed quite easily and this is a very cheap and simple method of increasing stocks of favourite plants, including lupins, aquilegia, hollyhock, delphinium, anchusa, and gaillardia. Seed should be saved from healthy plants only and sown while it is still fresh. Some seeds may take as long as 6 weeks to germinate and it is best to leave the boxes undisturbed until the plant seedlings are readily distinguishable from the weeds.

Dahlias

Dahlias may be increased by dividing clumps which have been lifted or by taking cuttings in the form of new growths from the tubers, as was described in the notes for September.

Dahlia tubers should be planted early in November to ensure that the plants get a good start before the dry weather begins. Those that have been planted earlier should be tied as it becomes necessary.

Dahlia mosaic virus symptoms are yellow rings on the leaves or stunted plants with yellow leaves. Badly infected plants should be dug up and destroyed, as there is no other way of eliminating the virus, but slightly infected ones may be left if desired, as some are able to produce quite good flowers.

Trees and Shrubs

Shrubs that flower in early summer should be pruned when they have finished flowering. Pruning consists mainly of removing some of the shoots that have flowered and thinning out weaker growths.

Rhododendrons, azaleas, and lilacs should have the dead flower heads removed as soon as possible to prevent the formation of seed. Other subjects such as ericas, leptospermums (manuka), and prostantheras should have about half of the growth that carried the flowers cut away. By doing this the plants are kept neat and bushy and the formation of seed is reduced. Hibiscus and poinsettia may be pruned fairly hard in November, all weak and spindly growth being removed, and the remaining healthy wood cut back by about half. When these shrubs break into growth in about a month a dressing of blood and bone at 4oz. to the square yard may be applied. Some shrubs often throw growths similar to suckers from the base. These should be removed, as they grow very rapidly and, unless needed to fill a gap, may spoil the shape of the bush or tree.

A mulch of well-rotted sawdust, compost, or leafmould may be applied round the roots of shrubs while the soil is still moist. This helps to keep the roots cool, conserves the moisture in the soil, and checks weed growth. Mulching loses much of its value if the soil is too dry when the material is put on, and a good soaking may be necessary before application of the mulch if there has been little or no rain for 2 or 3 weeks.

Hedges will have started into active growth in most parts of the country and should be given their first trim as soon as they begin to look untidy. Established hedges should be cut back as closely as possible to where the new growth began, or they will grow upward and thicken out more than is required. Trimming should never be extended into bare wood, as often there will be no new growth when this is done after the sap has begun to flow.

If it is desired to cut back severely an old hedge (except conifers), it should be done in early spring before growth begins. Early trimming is more likely to induce new growth from old, bare wood. Young hedges should not be trimmed too drastically for the first season, as very hard cutting will discourage the plants and they may take a long time to become attractive and bushy. Some trimming of strong young hedges will be necessary later in the season. When cut back hard conifers will not produce new growth from old wood.

Layering

Some ornamental shrubs which are hard to propagate from cuttings may be layered successfully. Layering may be done at almost any time of the year. Young wood is usually the most easily handled, but older wood may be quite satisfactory. Rhododendrons, *Magnolia stellata*, dogwoods, and any other shrubs which have made growth sufficiently long to be pegged down into the soil without breaking can be layered late in November. A cut is made on the under side of the branch at the spot where it touches the soil. Wire pegs are used to keep each layer in place and it is then left until it has rooted. The length of time varies with the different shrubs being layered and the formation of roots may be speeded up by using one of the root-producing hormones. Most layers will have rooted in 6 or 7 months and the new plant may then be separated from the parent by severing the stem as close as possible to the layer.

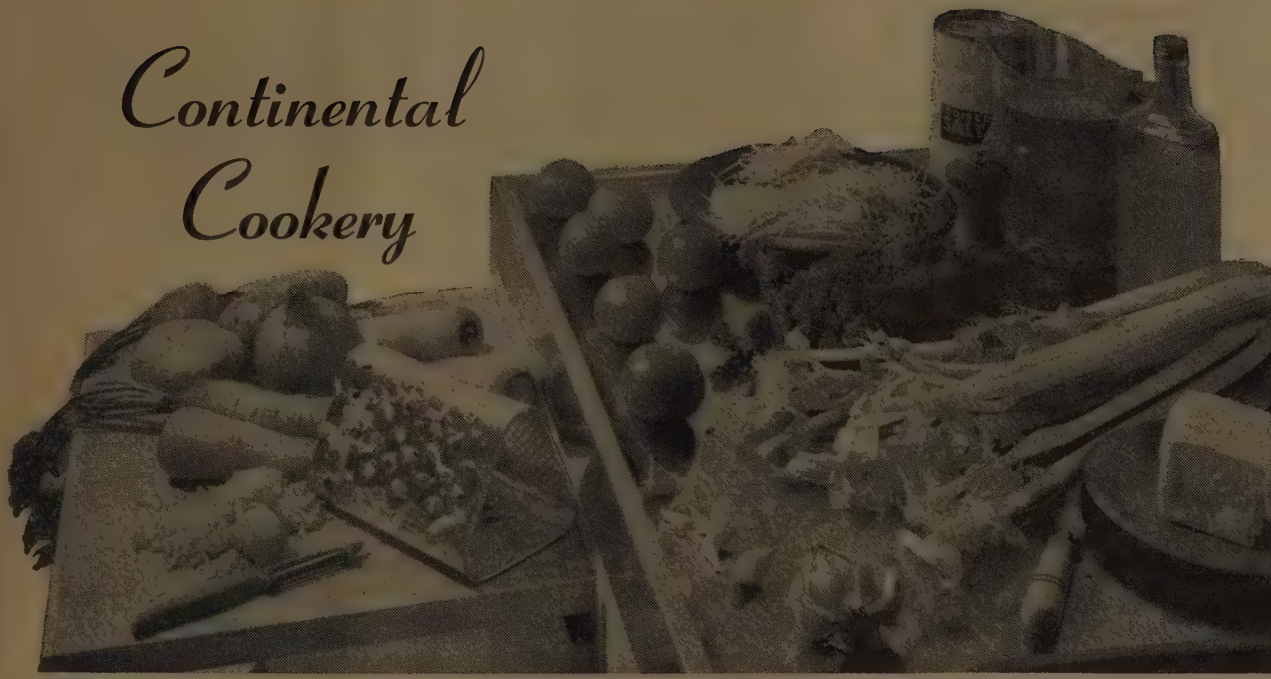
Staking

Plants such as lilies and taller-growing perennials should be staked without delay. Use stakes that are shorter than the ultimate height of the plants so that the foliage will make them less conspicuous. Gladioli that have not been staked should also be attended to with as little delay as possible. The stakes should be inserted 2in. or 3in. behind the plants and each spike tied loosely in several places as it grows larger. Staking of all these species is necessary for support and to decrease damage by wind and rain.

Roses

Suckers or basal growths arising from the stocks of roses should be removed to conserve the vitality of the bushes. If large and well-shaped flowers are wanted, judicious disbudding must be carried out. Rose plants should be dusted with flowers of sulphur at intervals of 2 weeks to control mildew. Nicotine sulphate at ¼ fl. oz. per gallon of water should be applied as a spray whenever aphids appear on the foliage or flower buds. Soft soap, ½oz. to 1 gallon, should be added to the water if nicotine sulphate is used alone, but is not necessary if the mixture contains other spray materials.

Continental Cookery



By DAPHNE EILERS,
formerly Field Officer in Rural Sociology, Department of Agriculture, Auckland

OVERSEAS visitors to New Zealand are often heard to say that the food here is monotonous and that the best is not made of the foodstuffs available. While often this criticism is unjust, there are many who are guilty of serving set types of meals with little imagination or variation in flavour. The conventional meal of roast lamb, green peas, and new potatoes is certainly delicious, nutritious, and satisfying, but a change from the conventional is always welcome, even if for some it may result only in a greater appreciation of the conventional.

THE French are renowned for their excellent cuisine. Admittedly expensive materials are used in exclusive restaurants catering for the tourist, but the peasant's wife can produce an excellent meal from foodstuffs which in this country would probably be put in the garbage can. This art with food is not confined to the French; all Continental peoples have the ability to make the best of foodstuffs available.

How, then, is this achieved and where is it that New Zealand's food methods differ so greatly? First, perhaps, it is in the flavour.

Herbs

The Continental makes much greater use of herbs. In New Zealand parsley and mint and thyme and sage are used fairly frequently; chives are used sometimes and other herbs rarely. There are many herbs which will grow in New Zealand with little or no trouble and can be used to advantage in many dishes.

Marjoram

Marjoram can be used in the green stage or after drying. It is usually raised from seed annually. Its flavour blends particularly well with fish, but it may be used with meat in stews and sauces quite satisfactorily. Sweet marjoram or knotted marjoram is slightly blander in flavour and is suitable for use with poultry as well as fish.

Chervil

Chervil is an annual herb which is used either as a garnish or in sauces for poultry and fish. Chopped and sprinkled over new potatoes just before serving, chervil imparts a pleasant flavour and odour.

Savory

There are both summer and winter varieties of savory. It has a strong flavour and should be used sparingly. Summer savory is used by the French when cooking broad beans in the same way as mint is used with green peas in New Zealand. Savory can also be used in green salads.

Rosemary

Another strongly flavoured herb is rosemary and only a few leaves should be used. It is usual to have rosemary in fish dishes or in sauces to be served with fish.

Lovage

Lovage has a celery flavour and both the leaves and the seeds may be used in soups and stews.

Balm

Fish dishes are improved by a few leaves of balm. It was once popular for making tea for invalids.

Fennel

The leaves of fennel may be used in salads and the seeds in pickles and savoury dishes, particularly fish dishes.

Bay Leaves

The leaves of the bay tree may be dried successfully if hung in a warm, dry place. They may be bought ready dried. Their flavour enhances any meat dish in which they are used.

The herbs mentioned are only a few of the great number which may be used in cookery to give variety in flavour. When they are used in their fresh state it is usual to chop them finely. The term "aux fines herbes" refers to food served with the finely chopped fresh herbs either sprinkled over the food as in certain grills or omelets or added to the gravy or

HEADING PHOTOGRAPH: Ingredients for minestrone.

sauce. In either case the herbs should be added just before serving. If they are used after drying, they should be tied in a piece of muslin and removed before serving. If the dried pieces of herb are allowed to escape into the liquid, they give an unpleasant texture. Frequently in Continental recipes reference is made to the bouquet garni. This consists of a combination of herbs tied in a muslin bag. The usual combination is parsley, thyme, and a bay leaf. Sometimes fresh celery leaves or lovage are included too.

Herb brandy is another way in which the herb flavour can be introduced into food. For this, freshly gathered sprays of thyme, mint, marjoram, basil, rosemary, and chervil are put into a jar half filled with brandy. After 2 or 3 days the sprays of herbs are replaced by fresh ones and the process repeated in this way until the brandy has taken on the pungent flavour of the herbs. The brandy can then be added to foodstuffs. A teaspoon of herb brandy in salad dressing or butter or cheese sandwich spreads gives a subtle flavour change.

Herb Butters

Herb butters can easily be made and are delicious served with grills. The herb, for example, parsley, is chopped finely and then mixed thoroughly with some creamed butter. The herb butter can then be formed into balls with butter pats for easy service. Horse radish, if minced finely and mixed with butter, can be used in the same way with steak or roast beef.

Garlic

Garlic seems to be the most predominant flavour in Continental cookery and it is one which can be used in many dishes. The danger in using it is to develop too lavish a hand. As it has a particularly penetrating odour, it can be unpleasant to others not addicted to its use. One clove of garlic should be quite sufficient to flavour a dish serving 4 to 6 people.

One way to use it is to place a teaspoon of salt on a saucer, put the peeled clove of garlic on top of it, and crush it with the back of a spoon. The salt absorbs the juice of the garlic and the flavour will be well distributed. Ready-prepared garlic salt is on sale in New Zealand.

Where the garlic is to be dried it is best to cut it into fairly thin slices. For salad dressings it is useful to have garlic vinegar. This may be prepared by dropping a peeled clove of garlic into a jar of vinegar and removing it after 2 or 3 days. The vinegar will retain a subtle tang of garlic only faintly discernible but sufficient to give salad dressings an unusual flavour. Splinters of garlic may be inserted in a mutton roast or in the fat used for roasting. One clove of garlic, a bouquet garni, and 1 tablespoon of vinegar will transform an everyday beef casserole.

Cooking with Oil

Another way in which Continental cookery differs from New Zealand's is in the use of cooking oil. Olive oil is the one most widely used and it imparts a rather nutty flavour to food cooked in it. Its flavour is not always pleasing to the New Zealand palate and peanut oil or soya bean oil may be substituted for it. Peanut oil does not keep satisfactorily for long periods, so that unless it is to be used extensively, it is not wise to buy a large amount. Food fried in oil has a crisp outer surface and the excess oil drains off much more readily than does fat.

Green salads tossed in oil and vinegar dressing (given later in this article) not only look crisp and fresh, but they have a much better flavour. Heavy, sweet dressings are inclined to mask the delicate flavours of salad greens and they are rarely served on the Continent. If a rich dressing is required, a mayonnaise made with oil and egg yolks is used (given later).

Use of Wine

Wine, both red and white, is not only served with food more frequently than is done in New Zealand, but it is also used in the dishes themselves. The alcohol in the wine is evaporated off during the cooking and only the flavour is left to enhance that of the food. A small amount is all that is necessary; ¼ to ½ cup of red wine (claret or burgundy) to beef dishes or the same amount of white wine (hock, chablis, or cider) to poultry gives a wonderful flavour. An ageing fowl if jointed and cooked in a casserole with one cup of cider, a tablespoon of rum, and chopped onion and garlic and stock will be tender and delicious. Less tender cuts of meat will be improved if they are cooked in the following mixture before stewing or braising. In a bowl mix ¼ cup of red wine with 2 tablespoons of oil, add some chopped onions and pepper, salt, and herbs to taste, and place the meat in the liquid. The meat should be allowed to stand in the mixture for at least 2 hours and at the end of that time it can be drained and cooked. The wine mixture may be heated, and when its volume is reduced, thickened and served as a gravy.

Sauces

Yet another way in which a plain dish can be transformed is by serving a special sauce with it. Spaghetti is a very ordinary dish as New Zealanders generally know it, but the spaghetti the Italians serve is a much more exciting meal. It is very easily prepared and there is a wide variety of tasty sauces which may be served with it.

The richness of the sauce depends on the course in the meal in which the spaghetti is to be served. If it is to be the main course, a tomato and meat sauce would be used, but if only an entree course a tomato and vegetable mixture would be a better choice. The name of the dish is taken from the type of sauce; for example, spaghetti a la milanaise is spaghetti served with a sauce containing mushrooms, ham, tomato sauce, and cheese.

CONTINENTAL RECIPES

Soups

Minestrone

4oz. of butter
½lb. of tomatoes
2 or 3 carrots
1 clove of garlic
2 medium onions
4 or 5 sticks of celery (leaves and stems)
2 potatoes
A few sprigs of parsley (chopped)
3½ pints of stock or water
Pepper and salt to taste

Melt the butter in a saucepan. Add to this the peeled, sliced tomatoes and fry gently. Grate the other vegetables and add them to the frying tomatoes. To the vegetable mixture add the 3½ pints of water or stock and simmer all until vegetables are tender. Just before this soup is served some cooked noodles or macaroni may be added. Grated cheese, too, may be sprinkled on the soup when served into bowls.

Vegetable Soup

3 cups of shredded mixed vegetables (cauliflower, leek, onion, carrot, potato, cabbage, swede)
2 cups of water
1 teaspoon of salt
1 bouquet garni
2 cups of stock
Pepper

Cook the vegetables in the water with the salt and the bouquet garni. When the vegetables are tender add the stock and some ground pepper to taste. Reheat. Remove the herbs and serve with fried croutons.

Note: Whole peppercorns ground in a pepper mill have a much more spicy flavour and are less hot than ready-ground pepper.

Sauces

Milanaise (to Serve with Spaghetti)

2 cups of tomato puree
2 medium onions (sliced)
1 clove of garlic (cut finely)
4oz. of ham
Mushrooms
2 tablespoons of oil or butter
Pepper and salt to taste

Heat the oil or butter in a heavy frying pan. Brown the sliced onion and garlic in the hot oil and remove them from the pan. Cut the ham into small pieces and cook it in the oil. When the ham is done remove it from the pan and cook the peeled sliced mushrooms. If necessary, more oil should be added. When the mushrooms are softened add the ham, onions, and garlic and the tomato puree. Stir and cook gently until reduced slightly in bulk and of a fairly thick consistency. Season well with salt and pepper. Serve over cooked spaghetti and sprinkle with grated tasty cheese.

This recipe is sufficient for 6 servings of sauce.

Herbed White Sauce

To every cup of basic white sauce add the following just before serving:—

1 teaspoon of minced parsley
1 teaspoon of minced chives or shallot tops
1 teaspoon of mixed minced thyme, majoram, rosemary, and basil

If desired, the parsley and chives may be used alone. If dried herbs are to be used, allow a quarter of the given quantities.

Serve with boiled vegetables.

Swiss Sauce (to Serve with Grilled Steak)

2oz. of butter
1 shallot (finely chopped)
1 small clove of garlic
Salt to taste
1 teaspoon of chopped parsley
1 teaspoon of anchovy sauce
1 tablespcon of brandy

Cream the butter and gradually beat in the other ingredients. Place the mixture on an ovenproof platter and when steak is almost ready heat the platter in the oven until the butter is hot and bubbling. Arrange the hot steaks on top of the hot sauce and serve at once.

Onion Sauce

2 medium onions
1 cup of milk
2 tablespoons of flour
2 tablespoons of butter
Salt and pepper to taste

Peel the onions and boil them in salted water until cooked. Drain the onions and chop them fairly coarsely. Melt the butter in a saucepan, add the flour and seasoning, and heat until the mixture bubbles. Remove from the heat and gradually add the milk to the hot mixture, stirring all the time until blended. Return saucepan to stove and heat until thickened, stirring all the time. To the sauce add chopped onion and season to taste. A pinch of nutmeg may be added if desired.

Salad Dressings

Oil and Vinegar Dressing

1 small saltspoon of salt
½ saltspoon of pepper
1 saltspoon of prepared mustard
1 tablespoon of wine vinegar
2 tablespoons of salad oil

Mix the mustard, salt, and pepper thoroughly with the vinegar. Add the oil to the mixture and beat well.

Mayonnaise

1 or 2 egg yolks
Salt and pepper to taste
1 cup of salad oil
2 tablespoons of vinegar or lemon juice

Separate the egg yolks from the whites and place the yolks in a bowl with the salt and pepper. Beat the egg yolks thoroughly. Add the salad oil a teaspoon at a time to the egg mixture, beating all the time. When a quarter of the oil has been used and the mixture has begun to thicken the oil can be added in slightly larger amounts. If it can be arranged, the best method is to introduce the oil in a steady trickle while the mixture is being beaten constantly. When all the oil is used add the vinegar or lemon juice. Chopped herbs may also be added if desired. Mayonnaise should be stored in a moderately cold place. If frozen, or too warm, the oil will separate out.

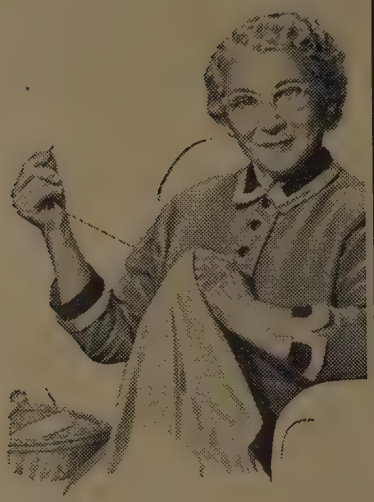
Meats

Hungarian Goulash

2lb. of stewing steak
1 carrot (peeled and sliced)
2 medium onions (chopped)
2 tablespoons of butter
½ teaspoon of paprika
1 teaspoon of salt
A shake of pepper
2 cups of stock
1 cup of tomato puree
2 tablespoons of flour
¼ cup of red wine
Bouquet garni
1 clove of garlic (sliced)
1 teaspoon of chopped parsley

Cut the meat into cubes and brown them in the butter. Add the sliced carrot, the chopped onions, and the paprika. Continue cooking for a few moments, then sprinkle the flour over the meat and vegetables. Stir and gradually add the stock and wine. Stir until smooth. The tomato juice is added next and the bouquet garni, salt, and a shake of pepper. The mixture should be simmered gently for an hour and then the garlic and parsley added. Cooking should continue until the meat is tender. Total time of cooking is about 1½ to 1¾ hours. If desired, this dish can be made in a casserole. Approximately 6 servings.

Wiener schnitzel may be served hot with vegetables or cold with salad.



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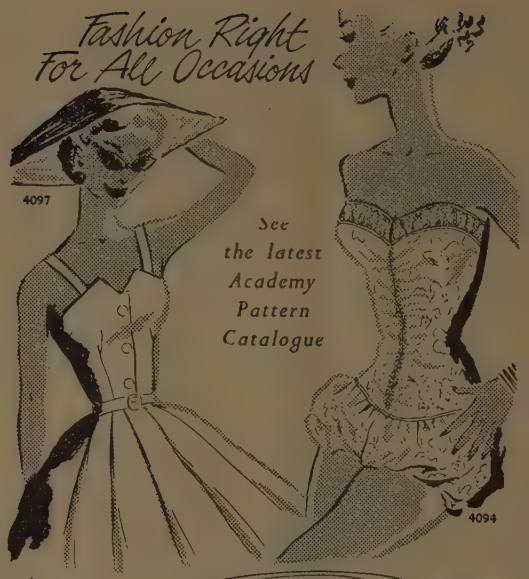

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Stuffing of prunes and apple in loin of pork.

Smothered Beef

2lb. of steak (in the piece)
2 large onions (sliced)
3 tablespoons of oil or dripping
2 tablespoons of prepared mustard
1 teaspoon of celery seeds
1 cup of tomato puree
Flour, to which salt and pepper have been added

Coat the meat with seasoned flour and brown it in the hot oil. Remove meat and place it in a large heavy pan. Brown the sliced onions in the oil and add to them the tomato puree, mustard, and celery seed. Pour this mixture over the meat and simmer gently for 2 hours. Serves 4.

Swedish Mutton Stew

2lb. of lean mutton or lamb
4oz. of butter
1½ teaspoons of salt
¼ cup of sour cream
½ teaspoon of peppercorns
2 cups of water
1 medium cabbage

Cut the meat into 2in. cubes and brown in the hot butter. Add the water and seasoning to the meat and simmer for ¾ hour. Add more water if necessary during the cooking. Wash the cabbage and cut it into eighths, removing the hard core. Add the cabbage to the meat and continue cooking until the cabbage is done (15 to 20 minutes). Add the sour cream and heat again. Serves 4.

Wiener Schnitzel

Slice of veal from the leg or fillet of veal
Beaten egg
Salt and pepper
Dried breadcrumbs
Butter or oil for frying

The slices of veal must be cut very thinly and then beaten flat with a wooden stick (the old-fashioned potato masher has size and weight for this). The veal is then seasoned with salt and pepper, dipped into flour, then into the beaten egg yolk, and finally coated with breadcrumbs. The coated meat slices are then browned gently in hot butter or oil. Tongs or spoons should be used to turn the meat to avoid piercing the coating of egg and breadcrumbs and allowing juices to be lost. The veal is served with melted butter and garnished with lemon slices.

Roast Veal Norge

The veal joint is placed in roasting pan with 2oz. or 3oz. of butter, depending on the fattiness of the joint. The meat is then roasted for ½ hour. At the end of that time ½ cup of milk and ½ cup of water are poured over the joint. Cooking is continued for the required time and the joint is basted at intervals with the milk and water mixture, more being added if necessary.

When the meat is cooked a sauce is made by thickening the juices from the pan and then adding 1 cup of sour cream or yogurt. Once the cream is added the sauce should not boil again.

Roast Loin of Pork with Prunes and Apples

Roasting a loin of pork with prunes and apples is a delicious way to treat a loin of pork and does away with the necessity of serving apple sauce with the pork.

The amount of apples and prunes necessary will depend on the size of the roast. The apples must be peeled and sliced and the prunes should be scalded and stoned. With a sharp knife partially remove the meat from the rib bone and stuff an equal quantity of apple and prune down between the meat and the bone. Tie the meat back on to the bone and roast the joint in the usual way.

This meat can be served with gravy, sugared potatoes, and other vegetables.

Sugared Potatoes

1lb. of potatoes
2oz. of sugar
2oz. of butter
Salt

Boil the potatoes in their jackets and when cooked peel off the skins. It is as well to use medium to small potatoes. Place the sugar in a heavy saucepan and carefully brown (caramel) it. Add to this the butter and salt. Rinse the skinned potatoes

in cold water and add them to the sugar mixture in the saucepan. Stir gently until the potatoes are hot and coated with the sugar mixture.

Desserts

Crepes Suzettes

1 cup of sifted flour
½ teaspoon of salt
3 eggs (well beaten)
2 tablespoons of butter (melted)
1 cup of milk

Mix the flour and salt together and add to the combined eggs and milk. Beat until smooth. Stir in the melted butter, pour into a jug, and cook on a hot, greased girdle or in a very small frying pan. Each pancake should be about 3in. in diameter. The pancakes are then dipped into the suzette sauce before serving.

Suzette Sauce

2 tablespoons of sugar
1 orange
4oz. of butter
½ teaspoon of orange peel (grated)

Melt the butter and add the sugar, orange juice, and orange peel. Heat for a few minutes until the sugar melts and the syrup thickens slightly.

Veiled Peasant Girls

2lb. of cooking apples
¾ cup of sugar
2 tablespoons of butter
3oz. of oven-dried breadcrumbs
1 tablespoon of sugar

Peel, core, and slice the apples, add ¾ cup of sugar, and cook carefully to a pulp, using no water if possible. A tablespoon of water may be added to prevent the apple from sticking if necessary. Melt the butter in a frying pan and add the breadcrumbs to this. Sprinkle the tablespoon of sugar over the breadcrumbs. Fry this mixture gently until golden brown, turning with a spatula or spoon all the time. Place the apple and breadcrumbs in alternate layers in a bowl and when quite cold decorate with whipped cream.

Apple Strudel

2 cups of flour
4oz. of butter
1 egg yolk
Water to mix
A pinch of salt
1lb. of apples
4oz. of brown sugar
2 tablespoons of soft breadcrumbs
½ teaspoon of mixed spices
2 tablespoons of sultanas

Rub the butter into the flour and salt until the mixture is the consistency of breadcrumbs. Mix a tablespoon of water with the egg yolk and add to the flour mixture. Add sufficient water to mix to a firm paste. Roll out thinly into a rectangle. Peel, core, and slice the apples thinly. Place on the pastry and sprinkle with the mixed sugar, breadcrumbs, spices, and sultanas. Roll up the pastry, damping the edges to seal them. Form the strudel into a horseshoe shape and place in a baking tin. Brush with melted butter and bake in a moderate oven at 350 degrees F. 30 to 40 minutes. Sprinkle with a little sugar just before serving.

All photographs by Sparrow.

Pieris forresti

THE lovely shrub shown bears white, waxy, lily of the valley-like flowers in terminal panicles that have a tendency to droop but are held well clear of the attractive dark, evergreen foliage. This gives the plant an extremely showy appearance when in full bloom in October; at the same time in the best forms of this plant young shoots appear with fiery red leaves and stalks, making the plant a real gem, reminiscent of the exotic poinsettia with its lovely, red, leaf-like bracts.

It is a native of the mountainous rain forests of upper Burma, and the Yunnan Province of Western China. Though these areas are in the tropics, many of the plants which grow in these mountainous areas are suitable for New Zealand conditions.

The plant is best grown in a partially shady position where the roots are kept cool and the full strength of the sun is broken by shade overhead. The tender young growths, evident in the photograph, can be damaged by strong winds in spring, and as these add to the beauty of the plant, either overhead shelter or good windbreaks are needed. A neutral or acid soil with good drainage is needed.

Pieris forresti can generally be kept at a height of from 5ft. to 6ft., but it may eventually grow much higher and have a fairly large spread, generally 5ft. to 8ft., though some forms have an upright habit.

Propagation is not particularly easy, but good plants are available from nurserymen. If, however, it is desired to propagate plants, autumn layering is the best method. For this the plants should be trained so that there are plenty of shoots near the ground. The soil around the plant should be cultivated some months before layering. Each layering shoot should be pegged down into a hole prepared for it. The layer should be cut with a tongue-like slit at the point where it is to be bent into a perpendicular position and staked to keep it firm. A small amount of a mixture of 2 parts of sand and 1 part of peat should be placed at the base of the layer, which then should be covered with soil and levelled off with the surrounding earth. It may take 18 months to 2 years for these layers to root and meanwhile they should be weeded and tended. When rooted they may be planted into beds until large enough to be moved into their permanent position. Cuttings taken in February or March should have a well-trimmed heel of old wood. They can be struck in a potting mixture made up of 1 part of loam, 1 part of peat, and 2 parts of sand. Cover with a shaded bell jar or jam jar and keep watered. They may be ready for planting into beds in 18 months.

This shrub should not be transplanted in midwinter when soil conditions are cold. Late autumn or early spring is the best time.

—F. E. WILKIN, Plant Quarantine Officer,
Department of Agriculture, Invercargill

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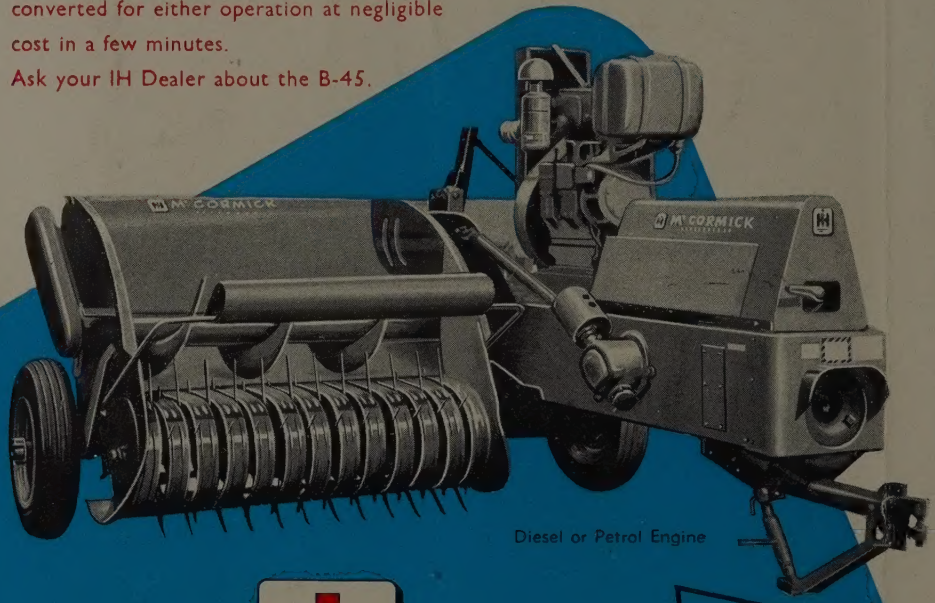

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